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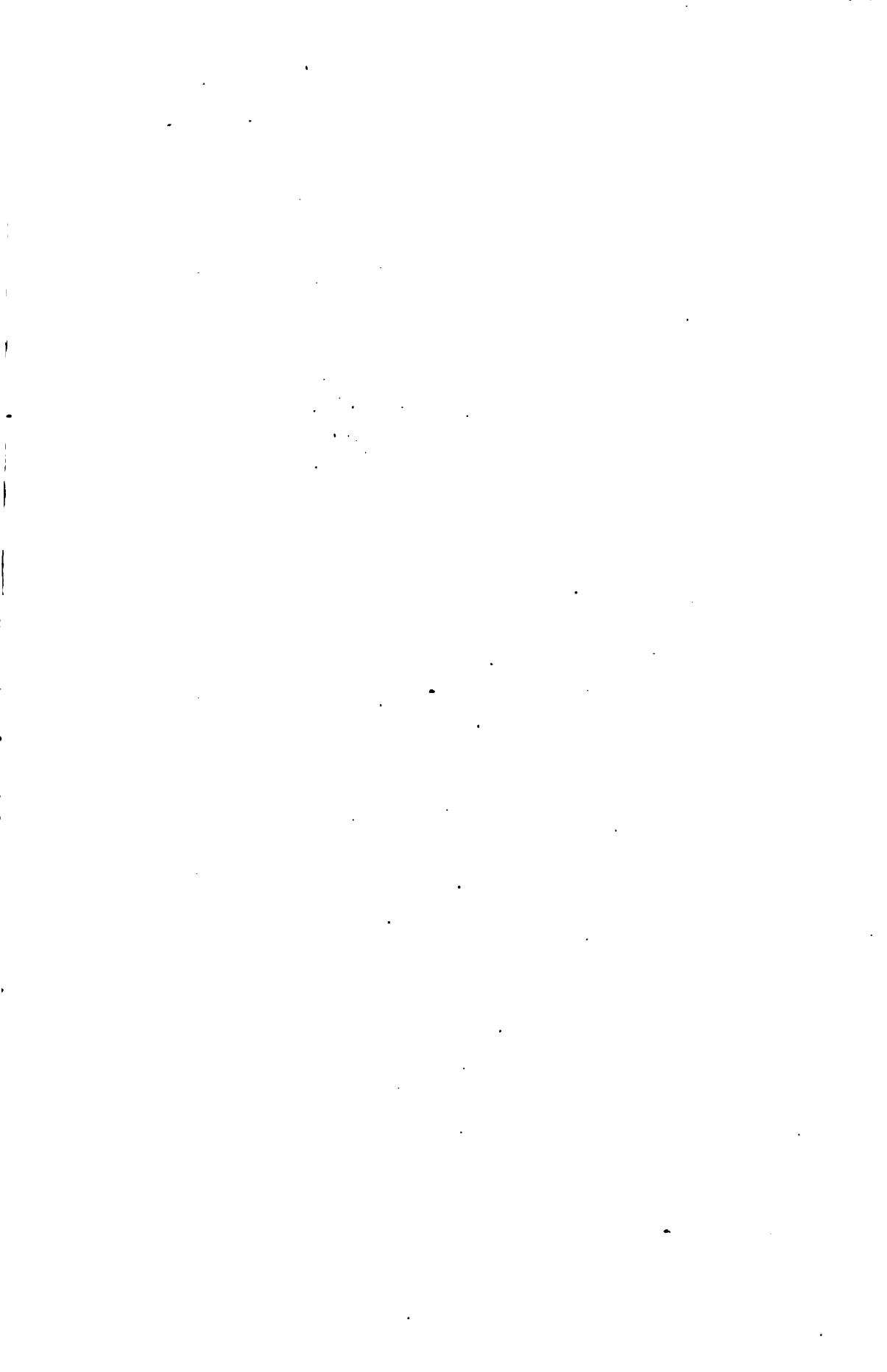
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THE GIFT OF
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THE
AMERICAN CYCLOPÆDIA.

VOL. VII.
EVESHAM—GLASCOCK.

THE
AMERICAN CYCLOPÆDIA:

A
Popular Dictionary
OF
GENERAL KNOWLEDGE.

EDITED BY
GEORGE RIPLEY AND CHARLES A. DANA.

WITH SUPPLEMENT.



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 EVOLUTION.

THE AMERICAN CYCLOPÆDIA.

EVESHAM

EVESHAM, a parliamentary borough and market town of Worcestershire, England, nearly encircled by the Avon, 18 m. S. E. of Worcester; pop. about 5,000. It is well built, and contains three churches, a mechanics' institute, reading rooms, and a library. The remaining tower of the once famous abbey of Evesham is one of the finest architectural specimens of the time of Henry VIII. The chief occupation is gardening, but gloves, hosiery, and parchment are manufactured, and there is an active trade in malt and hops.

EVIDENCE. Judicial evidence differs from the proofs by which human judgment is ordinarily determined in non-judicial matters, chiefly in certain rules established for the sake of facility in disposing of complicated questions of fact, or on grounds of public policy. These rules may be reduced under the following heads: 1, cases in which a rule is prescribed for the purpose of getting at a certain conclusion, though arbitrary, when the subject is intrinsically liable to doubt from the remoteness, discrepancy, or actual defect of proofs; 2, cases in which evidence is excluded on the ground of being untrustworthy and tending to unnecessary prolixity, or from its very nature likely to be untrue; 3, cases in which a legal presumption is substituted for actual proof, or in place of what could be proved, being supposed to be more consistent with the real rights of the parties than any result which could be expected from positive testimony; 4, the gradation of the weight of evidence, which will be found in some instances to be arbitrary in its origin, and perhaps not altogether in accordance with the ordinary process of judgment.—Under the first class will be included various rules which have been adopted, not from exact uniformity *per se*, but for the sake of having some rule of general application, among which may be specified the following: *a.* That after seven years' absence without

EVIDENCE

having been heard from, a man shall be presumed to be dead. It is obvious in this case that the period fixed upon is no more certain than any other, but it was necessary, for the protection of the rights of parties who were compelled to act upon some presumption, that a legal rule should be established. If a man therefore has been absent seven years without anything being heard of him, his wife may marry again without incurring a penalty for bigamy, though it has not been provided that the second marriage shall be absolutely valid in case the husband should afterward return; and his heir, or the person entitled to his estate by succession, becomes vested with presumptive ownership, the same as if his decease was actually proved. *b.* That after the exclusive possession of land or of an incorporeal hereditament for a certain period of time, a grant shall be presumed, and the title of the occupant will be sustained against all claimants. In England this period was formerly expressed with some vagueness, as being beyond the memory of man, and the rule applied there only to incorporeal estates; but by a statute (2 and 8 William IV.) the period has been limited to 20 years in cases of aquatic rights, ways, and other easements, and to 30 years in respect to right of common and other uses arising out of lands, except tithes and rents. In the United States the presumption is generally the same both in respect to corporeal and incorporeal estates. In a large number of the states 20 years' exclusive, undisturbed, and uninterrupted possession, under claim of right, is sufficient to establish title to lands or easements. In some states a shorter period is prescribed, either generally or for particular classes of cases, as for example those in which the claim of right is under purchase at a tax or judicial sale. *c.* That deeds more than 30 years old may be used as evidence without proof of their execution; in other words, that they

prove themselves. The presumption in such cases is that the subscribing witnesses or others by whom proof of execution is ordinarily made may be dead, but the rule is the same even if such witnesses are actually living. In offering such a deed in evidence, however, it is necessary to give some account of the custody of it, and to show that possession has been consistent with its provisions, so as to rebut any suspicion in respect to its genuineness. *d.* An infant under the age of seven years is conclusively presumed to be without discretion. Beyond that age it will be a subject of proof whether he is *doli capax*, but prior to that time no inquiry is permitted. So an infant under the age of 14 is presumed incapable of committing a rape, though in fact there are instances of sexual capacity before that age. So when husband and wife are living together and impotency is not proved, the issue will be presumed legitimate, although it should be proved that the wife has during that time committed adultery. *e.* By the common law, if a wife do any act in the presence of her husband amounting to felony, other than treason or murder, she is presumed to have been under coercion, and therefore not criminally liable. This presumption, however, is allowed but limited force in the United States.—The second class of cases includes two rules which were formerly of very frequent application. *a.* What is called hearsay evidence is inadmissible. By this is meant that a witness should not be permitted to testify what he has heard another person say, but only what he knows himself. To this rule there are some qualifications rather than exceptions. Thus it is sometimes proper to prove what was said by a person at the time of performing a certain act, as having some tendency to explain the intent, and therefore admissible as a part of the *res gestæ*, according to legal phraseology. In such a case, however, what was said does not strictly come under the designation of hearsay, but is itself a principal fact. So also it is admissible to prove what has been said by a party to an action. This again is a principal fact, or at all events comes under the designation of declarations or admissions, and as such is admissible. So it is permitted in cases of homicide to prove dying declarations, that is, what is said by the murdered person shortly before and in expectation of death. This is not unusual in trials for murder, and is competent evidence, both to show the manner of the death and who was the murderer; but it must be strictly confined to the homicide, and to facts which it would have been competent for the party to have testified to had he survived. The testimony of a witness on a former trial may also be proved on a second trial, in case of his decease prior thereto. Again, witnesses are allowed to testify to matters of tradition in respect to old boundaries of estates. The rule in England is limited to cases in which some public right is involved, as when a right of

common is in question; but in the United States it has been allowed in many cases where the lines of large tracts of land became material in determining the limits of smaller estates. The traditional evidence, as it is called in such cases, consists of proof of what has been said long since by persons who may be supposed to have had some personal knowledge, or to have heard from others who had such knowledge. Pedigree, including the facts relating to birth, marriage, and death, may also be shown by proof of what has been said by members of the family or relatives of the person whose parentage or relationship is in question. Many other illustrations could be cited, but these will suffice. It should be remarked that upon the same principle by which the kind of evidence last referred to is admissible, other modes of proof, which are ordinarily classed under hearsay, though they in fact belong to that species of evidence in no other sense than as above explained in respect to oral testimony, are admitted, such as a family register, inscriptions on monuments, and the like. But with the exceptions, if they may be so called, which we have specified, hearsay evidence is wholly and absolutely excluded by the English law. The reasons usually given for this exclusion are its uncertain and untrustworthy character, the endless prolixity to which it would lead in the attempt to sift facts in judicial proceedings, the ease with which it might be manufactured for the occasion, and the probability that better evidence is attainable. *b.* Another rule relates to the competency of witnesses, and it has been more prolific of subtle distinctions and perplexing questions than any other rule in the law of evidence. A chief ground of exclusion was formerly interest in the subject of the action. The theory was that there is an inevitable tendency to suppress or pervert the facts under the influence of a supposed interest in the result. This of course constituted a proper exception so far as respects credibility; but instead of receiving the testimony subject to a proper discrimination as to its effects, courts relieved themselves of all embarrassment in determining its relative weight, by wholly excluding the testimony of an interested witness. Under this rule not only the parties to the action, but all persons having an interest in the result, were, as a general rule, adjudged incompetent to testify. In determining, however, the nature of the interest which should constitute a disqualification, it was found exceedingly difficult to fix precise rules of general application, and much confliction was involved in the decisions. Finally it was settled that the interest must be a direct gain or loss by the operation of the judgment in the action, or that the record would be evidence for or against the witness in some other action. But no interest other than pecuniary was sufficient to exclude, and therefore near relatives might testify for each other even in the most serious cases, and where the temptations to shield them

by untruthful statements might be the strongest possible. But husband and wife were not admitted to testify for or against each other, for which two reasons were principally assigned: 1, that it would tend to destroy the domestic harmony; and 2, that the wife was under such coercion of the husband as would be likely to lead her to distort or suppress the truth. An exception, from the necessity of the case, was made of prosecutions for injuries done or threatened by one against the other. The conviction at length became general that the exclusion of witnesses on account of interest worked injuriously, and accordingly, both in England and the United States, the system has been virtually abrogated. By statute 3 and 4 William IV., c. 42, it was provided that no person offered as a witness should be excluded on the ground that the verdict or judgment in the action could be used for or against him. The act 6 and 7 Victoria, c. 85 (1843), provided that no one, except a party, or the husband or wife of a party, should be excluded from testifying on the ground of interest in the subject of the action or event of the trial. The act 14 and 15 Victoria, c. 99 (1851), enacted that parties and persons on whose behalf a suit is brought or defended shall be competent and compellable to testify as witnesses for either party, except that in criminal proceedings for an indictable offence neither the party charged nor the husband or wife of such party could be a witness; and except also that the provision should not apply to actions founded upon adultery, or for a breach of promise of marriage. By a subsequent act, 16 and 17 Victoria, c. 83 (1853), the husband or wife of a party in a civil action was made competent as a witness except in cases of adultery, but with the qualification that such witness should not be bound to disclose any confidential communication made by either to the other during marriage. In the United States similar provisions have very generally been adopted; and as a rule all persons having knowledge of material facts are competent and compellable to testify, except husband and wife against each other, and the defendants in criminal proceedings. The former, however, are allowed to be witnesses for each other, and by consent may be called by the opposite party. In a number of the states the defendants in criminal cases are allowed either to testify in their own behalf under oath, or to make a statement without oath which the jury may receive as evidence; but constitutional provisions forbid their being compelled to testify against themselves.—The third of the classes into which we have divided the rules of evidence consists of presumptions of law in lieu of actual proof, or of what could be proved, under which may be specified the following: *a.* The statutes of limitation, by which a period of time is fixed when a debt shall be presumed to have been paid, or satisfaction to have been received. This sort of presumption is made not for want of actual

proof, as the period is usually short, but to put an end to controversy within a reasonable period. The current business of life has enough to employ our attention without our being burdened with the memory of all former transactions. (See LIMITATION, STATUTES OF.) *b.* Estoppels. A man is said to be estopped when it would be inconsistent with good faith or with the policy of the law to allow him to deny a certain fact or legal conclusion. Thus, if he claims under a deed or will, he is bound by all that is contained in it, and is estopped either from denying any recital therein, or from setting up any claim of title adverse to or inconsistent with such deed or will. An *estoppel in pais*, as it is called in the old cases, is when a man is precluded by his own act or admission from proving anything contrary thereto. An instance of this is when a man has by some statement or admission induced another with whom he was dealing to enter into a contract; he will not afterward be permitted to deny the truth of such statement or admission if the effect would be to work an injury to such third party. So a tacit admission, as when the owner of a chattel stands by while another sells it as his own, and neglects to give notice of his right; this will operate as an estoppel to his setting up his claim against the innocent purchaser. To this head also belongs what is called *res judicata*, that is to say, the rule that when a fact necessarily involved in an action is once determined it shall not afterward be called in question as between the same parties or persons claiming under them. A judgment or decree of a competent court is final not only as to what was actually determined, but as to every matter which was involved in the issue, and which could have been decided. The record of the judgment is the only proper evidence of what was in issue, and it cannot be proved *aliunde* that some matter was in fact involved and taken into consideration which does not appear by the record to have been involved in the issue. This is the rule as to decisions of tribunals in our own country. In respect to foreign judgments and decrees, the effect is the same when the court had jurisdiction of the case, and no fraud has been practised. The record itself, which must be produced, is not conclusive as to facts necessary to give jurisdiction, and a defendant will be permitted to prove that he was not personally served with process; so any fraud on the part of the court or its officers may be shown. But the regularity of the judgment having been established, it is conclusive upon all matters embraced in the issue.—The fourth class in the arrangement we have made of our subject, viz., the comparative weight of evidence, is of a twofold character. Judicial discrimination may lead to the rejection of testimony as being entitled to no weight at all, or it may determine the relative influence which it should have if admissible in the decision of a question of fact. The former we have already considered, so far as respects

the incompetency of witnesses and the exclusion of hearsay testimony. But evidence is sometimes excluded for reasons of more limited application. Thus, inferior testimony is not admitted when a party has it in his power to produce what is of a higher order; as if the question be as to the title to real estate derived from a deed, the best proof will of course be the production of the deed itself, and no other proof will be admitted as a substitute, unless a satisfactory reason is given for its non-production, as where it has been lost or destroyed. But in this case, the substituted evidence must be exclusively as to the contents of the deed. But where under statutes providing therefor conveyances of real estate are recorded, the record or a certified copy is allowed to be read in evidence with the same effect as the original. So when a contract is in writing, it is necessary to produce the writing itself, and no other evidence can be given of the terms of such contract, without showing first the loss of the writing, or that for some other satisfactory reason it is impracticable to produce it; upon making which proof, parol evidence may be given as to the contents. And whenever, in the course of a trial, a fact comes in question, the evidence of which is in writing, the same rule is applied, viz., that no other evidence can be admitted than the writing itself if in existence, and if not, then only the substituted proof of its contents. It may however happen that nothing more than the purport can be shown, and not the exact phraseology; and some latitude will be allowed in such case, as by admitting proof of the acts of parties, and other circumstances, but still having in view to get at what was expressed by the writing. It does not follow, however, that when the best or what is called primary evidence cannot be produced, inferior or what is called secondary evidence will in all cases be admitted. Thus, hearsay evidence is in general excluded, even if none better can be procured. Upon the same principle, when a writing is put in evidence, it must have effect according to its terms, and parol evidence is not admissible to give it a different construction, or to defeat its operation according to the import thereof; or even if the writing is ambiguous, it cannot be explained by other evidence, if the ambiguity is intrinsic, that is, if the phraseology is *per se* doubtful. But if the ambiguity arises from something referred to but not fully expressed in the writing, explanation by other evidence is admissible. The latter is designated in law as a latent ambiguity, by which is meant that it does not appear upon the face of the instrument, but arises from something extrinsic. So also, when parties to a contract have undertaken to express it in writing, it will be assumed that they have expressed the whole, and nothing can be added by parol evidence, so far as relates to what the parties had in view at the time the contract was made. This is in effect saying that the written contract must

speak for itself, and will be presumed to contain all that was intended at the time, though this contract may be varied by a subsequent parol agreement for good consideration. To the general rule as above stated there are, however, some qualifications. 1. It is admissible to explain the subject of the contract and all the circumstances which may properly be supposed to have been had in view by both parties, for the purpose of understanding the phraseology which they may have used. 2. Terms peculiar to a science, profession, art, or trade may be explained by witnesses conversant therewith. 3. Parol evidence is admissible to impeach a written instrument, by showing fraud, illegality of the subject matter, or whatever would operate in law to avoid it.—The admissibility of evidence is in judicial proceedings a matter of law, and in jury trials is determined by the court. But it is not alone for this purpose that discrimination is required. A question of fact usually involves testimony on both sides, which must be collated, and the relative weight of which must be determined in order to reach a correct conclusion. Usually the court arranges and sifts the evidence in the instructions given to the jury, and it is obvious that without this aid the jury would be incompetent to analyze the evidence in a complicated case. Since the disqualification to testify by reason of interest has been abolished, the reasons which formerly were insisted upon as grounds of such disqualification are still proper to be considered with reference to the credit of the witness. It would be out of place to discuss these reasons at large in the brief summary of principles to which this article is necessarily limited. A single case may however be appropriately referred to, viz., the impeachment of a witness by direct testimony of other witnesses, showing that he is unworthy of credit. This kind of testimony is peculiar. The inquiry is limited to the general reputation of the witness whose veracity is in question, and the impeaching witness is not allowed to testify to particular facts. The usual course of examination is to inquire what is the general reputation of the witness as to veracity, and formerly it was permitted then to ask the impeaching witness whether he would believe the other under oath, but the authorities are in this country not altogether uniform as to the latter practice. It may not be improper here to say that the rule as to impeachment of a witness is seldom of use, except where he is notoriously destitute of principle. A witness is also allowed to be impeached by showing that he has made out of court statements contradictory to his evidence in court; but before these are permitted to be shown his attention is called to them, that he may have opportunity for explanation.—We have thus briefly analyzed the general principles of the law of evidence. Our subject would however be imperfectly treated if we should not refer to some of the rules which have more particular relation to

the practice of the courts. One is that the best evidence must always be produced; or in other words, that inferior evidence will not be received when a party has it in his power to produce better. But it does not follow, as before remarked, that when a party has not the power to produce the best, any other without restriction is admissible. The secondary proof must still be such as is held competent under other rules, or it will be rejected. The meaning of the rule is that inferior evidence, although otherwise competent, shall not be admitted when better can be had. We have before adverted to the distinction between writings or documentary proof, and oral or, as it is usually called, parol evidence. The distinction is founded upon the uncertainty of memory. Whatever has been put in writing can never be proved by mere recollection with perfect exactness; the writing itself is of course the most trustworthy, and according to the rule above mentioned it must be produced or its loss proved before its contents can be shown by other evidence; and this is true whether the writing relates to the principal fact or subject of the action, or is merely incidental. Again, when the question is as to a fact respecting which there is evidence in writing, but an offer is made to prove the fact by evidence *aliunde* without producing the writing or proving its contents, the rule is that if the writing was the concurrent act of both parties, as if it was signed by them or was prepared with the privity of both as an expression of their mutual understanding, it is thereby constituted the primary evidence of the fact to which it relates, and must be produced. This includes not merely a written contract which is the subject of the action or defence, but any other writing which the parties have agreed upon as the expression of any fact incidentally involved in the action. There is this difference, however, between the two cases: that in the former no other proof can be received but the instrument itself, or if lost, proof of its contents; whereas in the latter there may be other evidence bearing upon the same point which is admissible, together with the writing, and in some instances without it, where it is not intentionally withheld. Thus a written correspondence between the parties may be material to show their understanding in respect to some transaction, but this would not preclude proof of conversations or other acts. If, however, the correspondence contains a contract, then, according to another rule, no other evidence can be received except what is necessary for the proper explanation of the meaning of the parties in the language used by them. It is not material which party has possession of the writing; the rule is the same in either case. If wanted by one party, and the other has possession of it, upon notice by him to the other to produce it, and its non-production, he may give parol evidence of its contents. It is to be understood that the rule

above mentioned applies only to a writing in which both parties have concurred. When it is a memorandum by one without the privity of the other, it cannot be evidence at all, except under the recent modification of the law of evidence allowing parties to be witnesses, and is subject to the same rule that applies to any other witness. The rule as to a memorandum made by a witness at the time of the transaction referred to in it is, that he may refer to it for the purpose of refreshing his memory; but having done so, he is to testify what with this aid he is able to recollect. But if he has no recollection independent of the memorandum, the later doctrine is that on proving that it was made at the time of the transaction referred to, and that he then had knowledge of the subject, the memorandum itself may be put in evidence. The mode of proving a writing which is attested by a subscribing witness is peculiar. In such a case the subscribing witness must be called if living and within the jurisdiction of the court; but if dead or absent from the country, proof of his handwriting or that of the party will be sufficient to make the instrument evidence. The exclusion of proof of execution by any other person than the subscribing witness has often been the occasion of inconvenience; and the reason usually assigned for it, viz., that the subscribing witness is supposed to have some knowledge of the subject which another would not have, is certainly very singular, as if he had such knowledge he would not be allowed to testify to it, if it would at all vary the effect of the instrument. In England, by acts 17 and 18 Victoria, c. 125 (1854), a subscribing witness to an instrument which is not required by law to be attested need not be called, but the instrument may be proved in the same manner as if there was no such witness. The rule that parol evidence is not admissible to contradict, vary, or explain a written instrument has been before referred to, and certain exceptions or qualifications were mentioned; but it should be added that in a proper proceeding instituted to reform the instrument, it may always be shown that, through accident, mistake, or fraud, it was not made to express the real intent and contract of the party. Such a proceeding must be in chancery, except where the common-law courts are vested with equity jurisdiction.—In the examination of witnesses, a very different mode is prescribed to the party calling a witness from what is allowed to the opposite party. The counsel of the former must not put leading questions, and if the witness should make adverse or unsatisfactory answers, still he was deemed the witness of the party and could be examined only in accordance with that theory; that is to say, he could not be cross-examined by such party. This at least was formerly the rule, but it has recently been relaxed so far as to allow him to be treated to some extent as an adverse witness, when it is apparent that he is so. On the other hand, cross-examination by the other

party is allowed to an almost unlimited extent, and the privilege is often used to pervert rather than elicit the truth. It would be difficult to fix a precise limit of restriction, as it necessarily rests very much in the discretion of the court; but the prevailing practice seems to be suited rather to a remote period, when from the disorders of society and consequent laxity of moral principle there was little reliance to be placed on the oath of witnesses, than to the present advanced state of social order.

EVOLUTION, the term now generally applied to the doctrine that the existing universe has been gradually unfolded by the action of natural causes in the immeasurable course of past time. The question how the present order of things originated seems natural to the human mind, and has been put by all the races of men. The answer given in their cosmogonies, that it was created as we now see it by supernatural power, has been generally accepted as a matter of religious faith. The early Greek philosophers first brought the question into the field of speculation, and taught that all natural things have sprung from certain primal elements, such as air, water, or fire. As regards the origin of life, Anaximander is said to have held that animals were begotten from earth by means of moisture and heat, and that man did not originate in a perfectly developed state, but was engendered from beings of a different form. Empedocles taught that the various parts of animals, arms, feet, eyes, &c., existed separately at first; that they combined gradually, and that these combinations, capable of subsisting, survived and propagated themselves. Anaxagoras believed that plants and animals owe their origin to the fecundation of the earth whence they sprung by germs contained in the air. Aristotle, the father of natural history, entertained much more rational views upon the subject, and it is maintained that he held opinions as to the causes of diversity in living beings similar to those that are entertained by the latest zoologists. It has been asserted that some of the early theologians, including St. Augustine and St. Thomas Aquinas, announced doctrines that harmonize apparently with the modern views of evolution. We however find no development of the ideas thus shadowed forth. Linnæus and Buffon seem to have been the first among modern naturalists who formed definite conceptions of a progressive organic development, but they did little to elucidate the idea. Immanuel Kant announced in 1755 his theory of the mechanical origin of the universe, and supposed that the different classes of organisms are related to each other through generation from a common original germ. Dr. Erasmus Darwin, grandfather of Charles Darwin, in his *Zoonomia* (1794), maintained the natural genesis of organic beings. But the first to frame a distinct hypothesis of development was Lamarck, who published his *Philosophie zoologique* in 1809, and developed his views still further in

1815 in his *Histoire naturelle des animaux sans vertèbres*. He held that all organic forms, from the lowest to the highest, have been developed progressively from living microscopic particles. Similar conclusions were arrived at by Goethe in Germany, and by Geoffroy Saint-Hilaire in France in his work *Sur le principe de l'unité de composition organique*, published in 1828. The views thus far were of a general and highly speculative nature, and without firm scientific ground-work. It was only when the question was narrowed down to that of the mutability or immutability of species, and to the causes and extent of variation as determined by observation and experiment, that the real difficulties of the case were grappled with, and the inquiry assumed a strictly scientific character. In 1813 Dr. W. C. Wells read a paper before the London royal society, in which he recognized distinctly the principle of natural selection as applied to certain races of mankind. In 1822 the Rev. William Herbert, afterward dean of Manchester, declared his conviction that "botanical species are only a higher and more permanent class of varieties;" and he extended this opinion to animals. Leopold von Buch, in his *Physikalische Beschreibung der Canarischen Inseln* (1825), expresses the opinion that varieties change gradually into permanent species, which are no longer capable of intercrossing. In 1826 Prof. Grant of Edinburgh published a paper on the *spongilla* in the "Philosophical Journal," in which he held that species are descended from other species, and that they become improved in the course of modification. Karl Ernst von Baer, in his *Ueber Entwickelungsgeschichte der Thiere* (1828), maintains similar views as to animals. Oken, in his *Naturphilosophie* (1843), published his belief in the development of species; and in 1846 J. d'Omalius d'Halloy of Brussels expressed his opinion that probability favors this theory rather than that of separate creations. Isidore Geoffroy Saint-Hilaire, in his lectures published in 1850, gives reasons for his belief in the modification of species by circumstances, and in the transmission of differences thus produced. In 1852 Herbert Spencer argued that species have undergone modification through change of circumstances. M. Naudin in the same year published a paper on the origin of species in the *Revue horticole*, in which he averred his belief that botanical species are formed in a manner analogous to varieties under cultivation; and Franz Unger, also in 1852, expressed similar opinions in his *Versuch einer Geschichte der Pflanzenwelt*. In 1853 Dr. Schaffhausen, in a paper published in the *Verhandlungen des Naturhistorischen Vereins des preussischen Rheinlands, &c.*, maintained the doctrine of progressive development of organic forms. On July 1, 1858, two essays were read before the Linnæan society, one by Charles Robert Darwin, entitled "On the Tendency of Species to form Varieties, and on the Perpetuation of Species and Varieties by

means of Natural Selection;" the other by Alfred Russel Wallace, entitled "On the Tendency of Varieties to depart indefinitely from the Original Type." These papers showed that these two naturalists had arrived at almost exactly the same general conclusions; but the priority may safely be assigned to Darwin, who, although he had not previously made public his views, had submitted a sketch of them as early as 1844 to Sir Charles Lyell, Dr. Hooker, and others. In 1859 he published the treatise entitled "On the Origin of Species by means of Natural Selection," which was the means of diffusing so widely the theory, elaborated by him through years of patient and careful investigation, that it is commonly designated by his name. In this work he did not apply the doctrine of evolution to the human race, although he had long held the opinion that man must be included with other organic beings; and it was not until after Huxley, Spencer, Lyell, Lubbock, Gegenbaur, Vogt, Rolle, Haeckel, Canestrini, Francesco, and others, had accepted the extreme conclusion, that he published "The Descent of Man, and Selection in Relation to Sex" (1871). In 1872 Haeckel, who previously had discussed the genealogy of man in *Natürliche Schöpfungsgeschichte* (1868), published his *Monographie der Kalkschwämme*, in which he claims to give an analytical demonstration of the problem of the development of species.—The theory as now generally held is thus stated by Prof. Huxley: "Those who hold the theory of evolution (and I am one of them) conceive that there are grounds for believing that the world, with all that is in it, did not come into existence in the condition in which we now see it, nor in anything approaching that condition. On the contrary, they hold that the present conformation and composition of the earth's crust, the distribution of land and water, and the infinitely diversified forms of animals and plants which constitute its present population, are merely the final terms in an immense series of changes which have been brought about, in the course of immeasurable time, by the operation of causes more or less similar to those which are at work at the present day." The idea expressed by the term development involves the same principle, but it is usually restricted to the evolution of organic beings. We will first consider the doctrine as applied to the development of the various forms of life, and then in its broader aspects as a theory of universal evolution.—It has been proved by geology that the earth and its life, instead of being called suddenly into existence a few thousand years ago, have existed for millions of years; and as the mountains and continents are known to have attained their present form by the action of natural agencies, it is thought probable that other objects of nature have been produced in a similar way. The earth has teemed with living beings through incalculable periods of time,

and fossil remains of them are found distributed through the rocky layers that have been successively formed, until they are several miles in thickness. But not all kinds of animals and plants existed from the beginning, leaving their mingled remains in the lowest strata; the lowest types of life, vegetable and animal, appeared first. The successive phases of life are so definite that they have been held as marking off the earth's history into a series of ages. The invertebrates (radiates, mollusks, and articulates) are found in the Silurian or oldest stratified rocks; and from the predominance of the mollusks the period has been called the age of mollusks. Fishes, which are higher in the scale, begin to appear in the Silurian, but become so abundant in the later Devonian period that it is called the age of fishes. Amphibious animals, as an advance on the fishes, appear in the carboniferous age, which again is followed by the age of reptiles. To this succeeds the age of mammals, and lastly comes the age of man, the series, which began with the lowest forms of life, terminating with the highest. That the order has been progressive, and that its lower terms have been more general in character, while the later terms have been more specialized and perfect, is admitted by all naturalists. Prof. Owen says: "In regard to animal life and its assigned work on this planet, there has plainly been an ascent and a progress in the main;" and he has "never omitted a proper opportunity for impressing the results of observation showing the more generalized structure of extinct as compared with the more specialized forms of recent animals." Prof. Agassiz holds that "the more ancient animals resemble the embryonic forms of existing species;" that is, are lower in the scale of development than the later forms. Mr. Wallace remarks: "As we go back into past time and meet with the fossil remains of more and more ancient races of extinct animals, we find that many of them are actually intermediate between distinct groups of existing animals;" the ancient fishes, for example, present unmistakable reptilian traits, while the early reptilians combined also the characters of birds which had not yet appeared. As regards the continuity of the course of life, Prof. Dana remarks: "Geological history is like human history in this respect; time is one in its course, and all progress one in plan. . . . The germ of the period was long working onward in preceding time, before it finally came to its full development and stood forth as a characteristic of a new era of progress. . . . The beginning of an age will be in the midst of a preceding age; and the marks of the future, coming out to view, are to be regarded as prophetic of that future. The age of mammals was foreshadowed by the appearance of mammals long before in the course of the reptilian age, and the age of reptiles was prophesied in the types that lived in the earlier carboniferous age." The animal kingdom displays a

unity of plan or a correlation of parts by which common principles are traced through the most disguising diversities of form, so that in aspect, structure, and functions the various tribes of animals pass into each other by slight and gradual transitions. The arm of a man, the forelimb of a quadruped, the wing of a bird, and the fin of a fish are homologous; that is, they contain the same essential parts modified in correspondence with the different circumstances of the animal; and so with the other organs. Prof. Cope says: "Every individual of every species of a given branch of the animal kingdom is composed of elements common to all, and the differences which are so radical in the higher grades are but the modifications of the same elemental parts." There are many cases of rudimentary and useless organs in animals and plants. During the development of embryos organs often develop to certain points, and are then reabsorbed without performing any function, although generally the partially developed organs are retained through life. Certain snakes have rudimentary hind legs hidden beneath the skin; the paddle of the seal has toes that still bear external nails; some of the smooth-skinned amphibia have scales buried under the dermal surface; rudimentary teeth have been traced even in birds; and there are rudimentary eyes in cave fishes and rudimentary mammae in men. Classification is an arrangement of living beings by related characters. In the earliest attempts the organic tribes were arranged in a serial order or a chain from the bottom to the top of the scale; but this has been abandoned, as also have those symmetrical systems which assumed that the characters of different groups are equivalents of each other. The endeavor to thrust animals and plants into these artificial partitions is of the same nature as the endeavor to arrange them in a linear series; and it assumes a regularity which does not exist in nature. Classification now represents the animal kingdom as consisting of certain great sub-kingdoms very widely divergent, each made up of classes much less widely divergent, severally containing orders still less divergent, and so on with genera and species, like the branches of a growing tree; and the old method of classification, as Mr. Spencer remarks, involves exactly the difficulty "which would meet the endeavor to classify the branches of a tree as branches of the first, second, third, fourth, and fifth orders; the difficulty, namely, that branches of intermediate degrees of composition exist." There is a remarkable analogy between the present distribution of animals in space over the earth and their past distribution in time as we trace their fossils in the successive geological formations. The larger groups, such as classes and orders, are generally spread over the whole earth, while smaller groups, such as families and genera, are commonly confined to limited districts; but when a group is restricted to one region, and is rich in the

minor groups called species, it is almost invariably the case that the most closely allied species are found in the same locality or in closely adjoining localities. The same fact is seen in geological distribution. Mr. Wallace observes: "Most of the larger and some smaller groups extend through several geological periods. In each period, however, there are peculiar groups, found nowhere else, and extending through one or several formations. As generally in geography no species or genus occurs in two very distant localities without being also found in intermediate places, so in geology the life of a species or genus has not been interrupted. In other words, no group or species has come into existence twice." From these facts Mr. Wallace deduces the following important law: "Every species has come into existence coincident both in space and time with a preëxisting closely allied species." The adherents of development maintain that these facts, and many others of kindred significance, are only to be explained by the continuous operation of a great natural law of descent and divergence by which the present life of the earth has been derived from its preëxisting life. That the numberless forms of life should have been held as independently created, so long as the earth was regarded as having been recently and suddenly called into existence, was inevitable; but now, when it is known that the order of nature is extended backward into immeasurable time, the supposition that species were called into existence by hundreds of thousands of separate and special creations, running through the geological ages, and as we approach our own epoch suddenly and unaccountably ceasing, is held to be an unwarranted assumption which science can no longer accept. As remarked by the Rev. Baden Powell: "The introduction of a new species is part of a series. But a series indicates a principle of regularity and law, as much in organic as in inorganic changes. The event is part of a regularly ordained mechanism of the evolution of the existing world out of former conditions, and as much subject to regular laws as any changes now taking place. If the series be regular, its subordinate links must each be so; the part cannot be less subject to law than the whole. That species should be subject to exactly the same general laws of structure, growth, nutrition, and all other functions of organic life, and yet in the single instance of their mode of birth or origin should constitute exceptions to all physical law, is an incongruity so preposterous that no inductive mind can for a moment entertain it." This is the ground taken by the great majority of contemporary naturalists. They believe in evolution in some form as a great fact of nature; but many think that we know nothing as to how it has been brought about, while others hold that the problem of the modes and causes of evolution, although obscure, is no more barred from successful investigation than are the other

phenomena of nature.—The following facts have been offered as throwing light upon the way in which the diversities of life have originated. Organic beings differ from inorganic in their modifiability. They are capable in various degrees of adaptation to new conditions. Plants taken from their native situations and cultivated in gardens undergo changes so great as often to render them no longer recognizable as the same plants. The muscles are strengthened by exercise and the skin thickened and hardened by pressure, while the bones of men who put forth great physical exertion are more massive than the bones of those who do not labor. In the words of Mr. Spencer: "There is in living organisms a margin of functional oscillations on all sides of a mean state, and a consequent margin of structural variation." These variations may become fixed through the law of hereditary descent. It is the law of transmission of characters which preserves species and varieties from generation to generation, oaks being always derived from oaks and dogs from ancestral dogs. It is not only the normal qualities that are perpetuated, but malformations, diseases, and individual peculiarities are also transmitted. While offspring tend to grow in the likeness of parents, they also tend to grow in unlikeness; while moulded upon the parental type, the resemblance is usually imperfect. Nor are variations confined to any particular organs or characters, but they may be manifested by every part, quality, or instinct of the creature. These divergences may be selected and fixed by breeding so as to give rise to new kinds or varieties. Nature begins the variation, art secures its perpetuation and increase. How profound are the modifications that may be thus produced is shown in the numerous breeds of dogs, all of which belong to the same species. Not only have they reached extreme diversities in size (the largest being, according to Cuvier, 100 times larger than the smallest), but in muscular, bony, and nervous development, in form, strength, fleetness, and variety of instinct and intelligence, their divergences are almost equally remarkable. Domestic pigeons afford another example of the great plasticity of the living organism, by which it can be moulded into the extreme diversities. Naturalists believe that from a single species, the wild rock pigeon, there have arisen no fewer than 150 kinds that breed true or hold to the variety; and how deep have become the differences among them is thus stated by Prof. Huxley: "In the first place, the back of the skull may differ a good deal, and the development of the bones of the face may vary a good deal; the beak varies a good deal; the shape of the lower jaw varies; the tongue varies very greatly, not only in correlation to the length and size of the beak, but it seems also to have a kind of independent variation of its own. Then the amount of naked skin round the eyes and at

the base of the beak may vary enormously; so may the length of the eyelids, the shape of the nostrils, and the length of the neck. I have already noticed the habit of blowing out the gullet, so remarkable in the pouter, and comparatively so in the others. There are great differences, too, in the size of the female and the male, the shape of the body, the number and width of the processes of the ribs, the development of the ribs, and the size, shape, and development of the breast bone. We may notice, too (and I mention the fact because it has been disputed by what is assumed to be high authority), the variation in number of the sacral vertebrae. The number of these varies from 11 to 14, and that without any diminution in the number of the vertebrae of the back or of the tail. Then the number and position of the tail feathers may vary enormously, and so may the number of the primary and secondary feathers of the wings. Again, the length of the feet and of the beak, although they have no relation to each other, yet appear to go together; that is, you have a long beak wherever you have long feet. There are differences, also, in the periods of the acquirement of the perfect plumage, the size and shape of the eggs, the nature of flight, and the powers of flight, so-called 'homing' birds having enormous flying powers; while on the other hand, the little tumbler is so called because of its extraordinary faculty of turning head-over-heels in the air, instead of pursuing a distinct course. And lastly, the dispositions and voices of the birds may vary. Thus the case of the pigeons shows you that there is hardly a single particular, whether of instinct or habit, or bony structure, or of plumage, of either the internal economy or the external shape, in which some variation or change may not take place, which by selective breeding may become perpetuated and form the foundation of and give rise to a new race." Nor is this variation confined to domestic animals. Wild species both of plants and animals vary, become diversified, and give rise to new varieties. As many as 28 varieties of oak have been made out within the limits of a single species. The wolf species exhibits some 15 varieties, and lions, tigers, bears, hyenas, foxes, birds, reptiles, and fishes all exhibit marked varieties, which show that wild species undergo modification in a state of nature. What was needed to make out the analogy of variation between wild and domesticated animals was to discover some process in nature which is the equivalent of human agency in breeding. Mr. Darwin believes that he has discovered this process, and calls it the principle of "natural selection." He says that living beings in a state of nature are subject to certain external conditions, such as climate, situation, character of soil, and exposure to enemies, by which they are surrounded and limited. They are endowed with enormous powers of increase, so that any one of the hundreds of thousands of species of plants or animals, if all

its progeny were preserved, would go on multiplying until it covered the earth or filled the sea. Space is fixed and food limited, and the consequence is a universal conflict, the war of races; and in the "struggle for existence" multitudes perish and comparatively few survive. This survival is not a matter of chance. Mr. Darwin maintains that it is regulated by law, and that those only survive which are in some way best adapted to the conditions of life. The strongest, the fleetest, the most cunning, and the best adapted to the conditions will live and multiply, while the less fit will disappear. The introduction of European plants and animals into New Zealand affords an instructive example of how races encroach on each other's areas, the weaker being extirpated by the stronger in the competition for existence. Dr. Hooker says: "The cow grass has taken possession of the roadsides; dock and water cress choke the rivers; the sow thistle is spread over all the country, growing luxuriantly up to 6,000 feet; white clover in the mountain districts displaces the native grasses; and the native (Maori) saying is: 'As the white man's rat has driven away the native rat, as the European fly drives away our own, and the clover kills our fern, so will the Maoris disappear before the white man himself.'" Mr. Darwin in his works gives a great number of facts showing how apparently trifling variations give advantages to their possessors, which determine their survival and become perpetuated in the race. The principle of natural selection, or, as it is termed by Herbert Spencer, the "survival of the fittest," is now generally recognized as a genuine agency or *vera causa*, and the opponents of development admit that it may give rise to varieties, although they deny that it is competent to produce the deeper diversities of species. The extent of its operation remains yet to be determined, but many naturalists agree with Prof. Helmholtz that Mr. Darwin has contributed to science an "essentially new creative idea." Mr. Darwin, however, does not assume to be the discoverer of the principle of natural selection, and he points out that others before him have recognized the action of the process, though without seeing its full significance. What he claims is to have first shown the efficacy of the principle in producing divergency of types under the laws of variation and heredity. But having discovered a new factor in organic development, and published his work on the "Origin of Species" at the fortunate moment when naturalists had become widely dissatisfied with the old views, he became prominently identified with the development doctrine, and this has led many into the error of regarding Darwinism as the equivalent of evolution, of which, as we are now to see, it is but a minor part.—The advance of civilization in the historical period gave rise to the modern idea of progress, which was strengthened by the discoveries made early in

the present century concerning the past course of terrestrial life. The process was crudely conceived, in the one case as the successive development of all living creatures in a graded and linear series, and in the other case as the continuous movement of humanity toward a state of final perfection. About the year 1850 Mr. Herbert Spencer entered upon the systematic study of the subject. The problem was strictly a scientific one, and he had a wide and accurate preparation for it by a mastery of scientific knowledge which Mr. Mill has pronounced "encyclopædic." Mr. Spencer was also remarkable for his power of analysis, his grasp of wide-reaching principles, and his independence of opinion. The essence of progress is change. Mr. Spencer asked what, then, are the laws of change by which it is effected? Complying with the Newtonian canon that the fewest causes possible are to be assumed in the explanation of phenomena, he took up the question as resolvable in terms of matter, motion, and force. Progress being a theory of the successive changes by which things are produced, his task was to ascertain the dynamical conditions or laws under which the forms of nature rise, continue, and disappear. The objects of nature coexist and are maintained in a certain order in space. Newton discovered that this is effected by the operation of a simple and universal law. The objects of nature undergo changes in time, emerging and vanishing, some quickly and others slowly: is there a universal law by which these changes also are governed? This was the aim of the research. Mr. Spencer early found that the conception of progress which implies movement in one direction only is erroneous. There is no unbroken march of events; breaks and regressions alternate with advancement, and descending as well as ascending changes have to be accounted for. He therefore rejected the term progress as having erroneous implications, and adopted the term evolution, as more fully indicating the scope of the inquiry and better expressing the strictly scientific nature of his theory. The naturalist Von Baer had already attempted to define and generalize the changes of organic growth, and had formulated them as from the homogeneous germ state to the heterogeneous adult state by a process of differentiation. Mr. Spencer soon found that this formula gave but a very partial account of what takes place in organic development. The change was shown to be not only from uniformity to unlikeness, or a differencing of parts, but from the indefinite to the definite, from the incoherent to the coherent, producing the integration of parts, or increasing unity with increasing complexity. The conditions and course of changes in which organic evolution consists being ascertained, the question arose as to their extent, and Mr. Spencer became convinced that the law of organic movement is not an isolated fact in nature, but "that the process of change gone through by

each evolving organism is a process gone through by all things." Science had shown that the universe, past and present, is subject to orderly changes; he discovered that fundamentally this order is one. The nebular hypothesis proposed by Kant, confirmed by Herschel and Laplace, and accepted by astronomers, explained the origin and motions of suns and planets by slow condensation from a nebulous mist diffused through space. The geological history of our earth shows that it has undergone a vast series of progressive changes, and, as Prof. Dana says, "was first a featureless globe of fire, then had its oceans and dry land, in course of time received mountains and rivers, and finally all those diversities of surface which now characterize it." The course of organic life, as we have seen, was a progressive unfolding into greater diversity and speciality. Mind is developed with the body, and therefore mental phenomena obey a law of unfolding. As human society is made up of units that are capable of these changes, it presents in the past a gradual development of intelligence, arts, and institutions, as now embodied in our diverse and complex civilization. By a careful analysis of the phenomena in these widely separated cases, Mr. Spencer showed that they all conform to a great general law, of which individual life is but a special case. Equally in the inorganic, the organic, and the super-organic spheres, the progressive changes are from the homogeneous to the heterogeneous by differentiation. But with increasing divergences there is also increasing definiteness, coherence, complexity, and integration. Evolution is thus a universal law, while the development of the individual and the career of the race, so far from being exceptional phenomena, are but parts of the great system of change to which the whole cosmos conforms. Evolution being thus disclosed as a universal dynamical law, the question next arises, how is it to be interpreted? Is it an ultimate law like gravitation, or is it a derivative principle deducible as a necessity from the established laws of matter, motion, and force? Mr. Spencer proves that evolution is a resultant of dynamical agencies, and that, given matter as a vehicle of change, motion as the result of change, and force as the cause of change, such are their established laws of interaction that evolution follows as an inevitable consequence. We can here only touch upon the leading elements of the elucidation, and must refer the reader to Mr. Spencer's "System of Philosophy" for the full elaboration of the subject. Modern science has established the great principles of the indestructibility of matter and the conservation of force. (See CORRELATION OF FORCES.) Mr. Spencer maintains that these resolve themselves into the single law of the persistence of force, and that this is the fundamental postulate of evolution. Whatever interpretation is given to the principle, it certainly becomes a fundamental condition of the

changes taking place in nature. If matter and force throughout the universe are neither created nor destroyed, all changes must be changes of transformation. The stock of material and energy being limited, each new effect must be at the expense of something preëxisting; and hence in the ongoings of nature one thing is necessarily derived from another, while the problem of advance becomes one of transmutation. Mr. Spencer traces out the several causes of transformation or factors of evolution, and shows that they are all corollaries from the supreme law of the persistence of force. Briefly indicated, these are as follows: 1. The principle of the rhythm of motion. Under the law of the persistence of forces and the diversity of their forms, there arise constant conflicts of effect, so that motions are not uniform but varying. Action is met by counteraction, and the result is that movements take a rhythmical form. Boughs, for example, sway in the wind, water is thrown into waves, sound arises in vibrations, earthquakes are propagated in shocks, planets swing through eccentric orbits, breathing is recurrent, the heart beats, scarcity alternates with abundance, and prices rise and fall. From the minutest organism throughout the whole frame of things to the most distant systems, from momentary pulses to geological cycles, the agitations of things take the form of thrills and surges, which produce incessant and universal redistributions of matter and force. How are these redistributions directed? 2. They are controlled first by the law of the instability of the homogeneous. The relatively homogeneous is the commencing stage of all evolution, and Mr. Spencer has shown that this is an unstable condition, and under rhythmic disturbance tends constantly to rearrangement and greater complexity. No object can exist without being acted upon and altered by forces, and no mass can be thus acted upon in all parts alike; unequal action therefore tends to destroy homogeneity and produce ever increasing diversity. For this cause the nebulous condition could not continue; the homogeneous germ divides into unlike parts; a class of animals or plants distributed over a geographical area, being unequally acted upon by environing conditions, would fall into diversity; and for the same reason a uniform social condition would be resolved into heterogeneous societies. 3. The transformations of evolution are further explained by the dynamical principle of the multiplication of effects. Throughout all nature simple agencies produce diverse consequences, every impulse of force yielding a multiplicity of results. A simple mechanical collision of two bodies may produce effects of sound, heat, light, electricity, and various chemical and structural changes; an accident to the foot may entail a train of consequences affecting the whole constitution; the upheaval of a continent may produce the most extensive alterations in the life of races;

while an invention like that of the steam engine works its multiform effects throughout civilization. By this law the principle of the instability of the homogeneous is powerfully reinforced, and the cause of universal movement toward greater diversity is rationally explained. But these modes of action alone could only result in a vague chaotic heterogeneity, and could not account for that orderly heterogeneity in which evolution essentially consists. 4. This finds explanation in the principle of segregation. When a mass is acted upon by forces which promote the redistribution of its parts, its units are not only differentiated and regrouped, but there is a segregation of like units which become separated from the neighboring groups. A familiar example of this is seen in the winnowing process, by which a force applied to a mixed mass brings all the grain together in one place and the chaff in another. The same thing is seen when several salts are dissolved in a liquid, and each crystallizes out by the combination of like chemical molecules. The organism conforms to this principle from its earliest stage of growth, the special elements of the bony, muscular, and nervous systems being withdrawn from the nourishing fluids and segregated in the distinctive parts. We have already seen that natural selection is a winnowing process, by which the unfit are excluded, and the better adapted are separated and preserved. In social development the same thing is seen. Not only are there continual differentiations of groups and classes by which society becomes heterogeneous, but these groups are unified by similarity of occupation, character, taste, and race. Stock brokers cluster in Wall street, and the Mormons segregate in Utah. Thus in all the spheres of change redistribution leads to unification. 5. This end is further promoted by the important dynamical law that motion takes place along lines of least resistance. The operation of this principle in inorganic nature is self-evident. Water forms its channels in the direction of least obstacles. Mr. James Hinton has shown that organic growth takes place in obedience to this law, and Mr. Spencer proves that it governs both mental and social changes. This law, in connection with the principle that movement set up in any direction is a cause of further movement in that direction, by which lines of connection become established, goes far to account for that integration of structures and functions which is disclosed in all phases of evolution. But can evolution go on for ever, or is it limited? This brings us to the process by which it is constantly antagonized and always finally terminated, the counter-agency of dissolution. All redistributions of matter and motion are either evolution or dissolution, but neither of these processes ever goes on absolutely unqualified by the other, and the change in either direction is but a differential result of the con-

flict. Mr. Spencer's formula, to be complete, must embrace both sets of correlative changes, and its determination led him to the following universal law: 6. Every change wrought in an object must be either a transposition of its mass, or a variation of its internal or molecular motion. As it loses this contained or insensible motion, there follows a concentration of the parts and increasing integration; if it acquires insensible motion, there is dispersion of the particles, or disintegration; that is, with concentration of matter there is dispersion of motion, and with absorption of motion there is diffusion of matter. These are the two aspects of the universal metamorphosis, and when approximately balanced there is equilibration. Evolution is integration; dissolution is disintegration. We have here confined ourselves to the most abstract statement of Mr. Spencer's theory; its concrete applications will be found extensively worked out in his "First Principles" and in the biological, psychological, and sociological divisions of his "Philosophical System." As a method of philosophy it aims only to explain phenomena; all phenomena being regarded as manifestations of the unknown power which transcends the reach of thought. Philosophy is regarded as the highest explanation of things, and as each science is unified by its largest inductions, the family of sciences is brought into a completer unity by a law that comprehends them all.—Whatever ultimate form the theory of evolution may take, its influence must be powerfully felt in the direction of future inquiries; for many who withhold their assent from it as an established truth of nature nevertheless recognize it as an invaluable working hypothesis. As remarked by Prof. Grove: "The first question is, does the newly proposed view remove more difficulties, require fewer assumptions, and present more consistency with observed facts than that which it seeks to supersede? If so, the philosopher will adopt it, and the world will follow the philosopher, after many days." Mr. Spencer's theory has been clearly summed up by himself in the following propositions: "1. Throughout the universe, in general and in detail, there is an unceasing redistribution of matter and motion. 2. This redistribution constitutes evolution where there is a predominant integration of matter and dissipation of motion, and constitutes dissolution where there is a predominant absorption of motion and disintegration of matter. 3. Evolution is simple when the process of integration, or the formation of a coherent aggregate, proceeds uncomplicated by other processes. 4. Evolution is compound when, along with this primary change from an incoherent to a coherent state, there go on secondary changes due to differences in the circumstances of the different parts of the aggregate. 5. These secondary changes constitute a transformation of the homogeneous into the heterogeneous—a transformation which, like the first,

is exhibited in the universe as a whole and in all (or nearly all) its details: in the aggregate of stars and nebulae; in the planetary system; in the earth as an inorganic mass; in each organism, vegetal or animal (Von Baer's law); in the aggregate of organisms throughout geologic time; in the mind; in society; in all products of social activity. 6. The process of integration, acting locally as well as generally, combines with that of differentiation to render this change not simply from homogeneity to heterogeneity, but from an indefinite homogeneity to a definite heterogeneity; and this trait of increasing definiteness, which accompanies the trait of increasing heterogeneity, is like it exhibited in the totality of things, and in all its divisions and subdivisions down to the minutest. 7. Along with this redistribution of the matter composing any evolving aggregate, there goes on a redistribution of the retained motion of its components in relation to one another; this also becomes step by step more definitely heterogeneous. 8. In the absence of a homogeneity that is infinite and absolute, this redistribution of which evolution is one phase is inevitable. The causes which necessitate it are: 9. The instability of the homogeneous; which is consequent upon the different exposures of the different parts of any limited aggregate to incident forces. 10. The transformations hence resulting are complicated by the multiplication of effects: every mass and part of a mass on which a force falls subdivides and differentiates that force, which thereupon proceeds to work a variety of changes, and each of these becomes the parent of similarly multiplying changes; the multiplication of these becoming greater in proportion as the aggregate becomes more heterogeneous. 11. These two causes of increasing differentiations are furthered by segregation, which is a process tending ever to separate unlike units and to bring together like units; so serving continually to sharpen, or make definite, differentiations otherwise caused. 12. Equilibration is the final result of these transformations which an evolving aggregate undergoes. The changes go on until there is reached an equilibrium between the forces which all parts of the aggregate are exposed to, and the forces these parts oppose to them. Equilibration may pass through a transition stage of balanced motions (as in a planetary system) or of balanced functions (as in a living body) on to the ultimate equilibrium; but the state of rest in inorganic bodies, or death in organic bodies, is the necessary limit of the changes constituting evolution. 13. Dissolution is the counter change which sooner or later every evolved aggregate undergoes. Remaining exposed to surrounding forces that are unequilibrated, each aggregate is ever liable to be dissipated by the increase, gradual or sudden, of its contained motions; and its dissipation, quickly undergone by bodies lately animate and slowly undergone by inanimate masses, remains to be undergone at an indefi-

nitely remote period by each planetary and stellar mass, which since an indefinitely remote period in the past has been slowly evolving; the cycle of its transformations being thus completed. 14. This rhythm of evolution and dissolution, completing itself during short periods in small aggregates, and in the vast aggregates distributed throughout space, completing itself in periods which are immeasurable by human thought, is as far as we can see universal and eternal; each alternating phase of the process predominating now in this region of space and now in that, as local conditions determine. 15. All these phenomena, from their great features down to their minutest details, are necessary results of the persistence of force, under its forms of matter and motion. Given these in their known distributions through space, and their quantities being unchangeable either by increase or decrease, there inevitably result the continuous redistributions distinguishable as evolution and dissolution, as well as all those special traits above enumerated. 16. That which persists unchanging in quantity but ever-changing in form, under these sensible appearances which the universe presents to us, transcends human knowledge and conception—is an unknown and unknowable power, which we are obliged to recognize as without limit in space and without beginning or end in time.” —Besides the works already mentioned, the following are important: Spencer's “First Principles,” “Principles of Biology,” “Principles of Psychology,” “Principles of Sociology,” and “Descriptive Sociology” (1860-’73); Darwin's “Variation of Animals and Plants under Domestication” (1868); St. George Mivart's “The Genesis of Species” (1871); Huxley's “Man's Place in Nature” (1864), “Lay Sermons” (1870), and “Critiques and Addresses” (1873). The relation of the doctrine of evolution to Christianity is discussed in “The Bible and the Doctrine of Evolution,” by W. W. Smyth (1873); “The Theory of Evolution,” by the Rev. E. Henslow (1873); “What is Darwinism?” by Charles Hodge, D. D. (1874); and “The Doctrine of Evolution,” by Alexander Winchell, LL. D. (1874).

EVORA, a city of Portugal, capital of the province of Alemtejo, 75 m. E. S. E. of Lisbon; pop. about 12,000. It is surrounded by a wall, and has remains of two ancient forts. It is the seat of an archbishop, and has a splendid Gothic cathedral, a number of convents, hospitals, a house of charity, a diocesan school, barracks, a museum, and some manufactures of hardware and leather. A university, established in 1550, and placed under the direction of the Jesuits, was suppressed at the time of the exile of that order (1767). Among the numerous monuments of antiquity are a ruined temple of Diana, and an aqueduct by which the city is still supplied.

ÉVREUX (anc. *Mediolanum*, or *Civitas Eburonicum*), a city of Normandy, France, capital of the department of Eure, 55 m. W. by N. of

Paris, in a pleasant valley on the Iton, which flows through the city in three branches; pop. in 1866, 12,820. It is surrounded by gardens, vineyards, and highly cultivated fields. It is the seat of a bishop and of several courts and schools, has a botanical garden, a public library, a museum of antiquities, a large hospital, an insane asylum, and cotton and woollen mills, and is the centre of a large trade in groceries and grain. Among the notable buildings are the abbey church of St. Taurin, dating from the 7th, and the cathedral, from the 11th century. At a little distance from the town was the fine old château of Navarre, founded in the 14th century, which was the residence of Charles Edward Stuart from 1746 to 1748, and of the empress Josephine for some time af-

ter her divorce, and was destroyed in 1896.—The town was taken from the Romans by Clovis, and in 892 the Normans captured and sacked it. In 989 it became the capital of a county of its name erected in favor of a son of Richard I., duke of Normandy. It passed into the possession of England with the rest of Normandy, and the name of the Devereux, earls of Essex, was probably derived from it. King John ceded it to Philip Augustus in 1200. In 1298 the county was given to Louis, son of Philip the Bold of France; and in 1828 his son Count Philip became by marriage king of Navarre. The county was confiscated from the son of the latter, Charles the Bold of Navarre, in 1878. In the vicinity, at Vieil Évreux, excavations have led to the discovery of the re-



Évreux.

mains of a theatre, baths, &c., which are supposed to mark the site of Mediolanum; and many medals and household utensils found here have been deposited in the museum of Évreux.

EWALD, Georg Heinrich August von, a German orientalist, theologian, and historian, born in Göttingen, Nov. 16, 1808. In 1831 he was appointed to the chair of philosophy, and afterward to those of oriental languages and theology, at Göttingen. He was one of the seven professors who were dismissed in 1837 on account of their remonstrance against the unconstitutional proceedings of King Ernest Augustus of Hanover. He spent some time in England, and was professor of theology at Tübingen from 1838 to 1848, when he was reinstated in his chair at Göttingen. Among his linguistic works are: *Grammatica Critica Linguae Arabicæ* (2 vols. 8vo, Leipzig, 1831-'3); *Ueber das äthiopische Buch Henoch* (1854); *Ausführliches Lehrbuch der hebräischen Sprache des alten Bundes* (6th and enlarged ed., 1855; also abridged, *Hebräische Sprachlehre für Anfänger*, 3d ed., 1862). His critical writings are very numerous, embracing works on Canticles, "The Poetical Books of the Old Testament," "The Prophets of the Old Testament," "The Three First Gospels," St. Paul,

John, &c. His great historical work is his *Geschichte des Volkes Israel bis Christus* (3d ed., 7 vols., Göttingen, 1864 *et seq.*; translated by J. Estlin Carpenter, "History of Israel," vols. i.-v., London, 1868-'73). He was the projector of the *Zeitschrift für die Kunde des Morgenlands*, and edited the *Jahrbücher der biblischen Wissenschaft*, in which he propounded his theological views. His leaning toward Baur and other adherents of the Tübingen school, with whom he became acquainted during his residence in that city, involved him in many controversies. In 1841 he was ennobled by the king of Württemberg. When Prussia took possession of Hanover in October, 1866, Ewald's fidelity to the extinguished dynasty subjected him to a trial for treason; but he was acquitted, and in May, 1869, he was elected a member of the North German parliament. His latest published works are *Das Sendschreiben an die Hebräer und Jacobus' Rundschreiben* (1871), and *Sieben Sendschreiben des neuen Bundes* (1871).

EWALD, Johannes. See **EWALD**.

EWBANK, Thomas, an American writer on practical mechanics, born at Barnard Castle, Durham, England, March 11, 1792, died in New York, Sept. 16, 1870. At the age of 13 he

was apprenticed to a tin and copper smith, and about 1819 emigrated to New York. In 1820 he commenced the manufacture of metallic tubing in that city, and retired in 1836 to devote himself to literary and scientific pursuits. In 1842 appeared his "Descriptive and Historical Account of Hydraulic and other Machines, Ancient and Modern; including the Progressive Development of the Steam Engine," of which the 15th edition was published in 1870. In 1845-'6 he made a visit to Brazil, recording his observations in a work entitled "Life in Brazil," with an appendix descriptive of a collection of American antiquities, New York (1856). From 1849 to 1852 he was United States commissioner of patents. He also wrote "The World a Workshop, or the Physical Relation of Man to the Earth" (1855); "Thoughts on Matter and Force" (1858); "Reminiscences in the Patent Office" (1859); and a variety of miscellaneous essays on the philosophy and history of inventions, which appeared chiefly in the "Transactions of the Franklin Institute." His "Experiments on Marine Propulsion, or the Virtue of Form in Propelling Blades," was reprinted in Europe. As a member of the commission to examine and report upon the strength of the marbles offered for the extension of the national capitol, he made some suggestions which led to the discovery of a means of greatly increasing the power of resistance to pressure in building stones. He was one of the founders of the American ethnological society.

EWELL, Richard Stoddard, a general of the Confederate States of America, born in the District of Columbia in 1820, died at Spring Hill, Tenn., Jan. 25, 1872. He graduated at West Point in 1840, and became lieutenant of dragoons. He served in the Mexican war from 1846 to 1848, and was breveted as captain for gallant and meritorious conduct in the battles of Contreras and Churubusco. In 1859 he was wounded in a skirmish with the Apaches. In May, 1861, he entered the confederate service, and commanded a brigade at the battle of Bull Run. Early in 1862 he was promoted to major general, and commanded a division in Jackson's campaign in the Shenandoah valley. He was conspicuous in the battles of Gaines's Mill, Malvern Hill, and Cedar Mountain, was worsted by Hooker at Bristoe Station, and lost a leg at the second battle of Bull Run. He was made a lieutenant general in May, 1863, and succeeded to the command of Jackson's corps, with which he was present at Gettysburg, the Wilderness, and Spottsylvania Court House. During the siege of Petersburg, being disabled from active service in the field, he had command of the garrison of Richmond. At Sailor's creek, during the confederate retreat, he was cut off by Sheridan, and surrendered, with 6,000 or 7,000 men, three days before the surrender of Lee at Appomattox. Toward the close of the war he had married a daughter of Judge Campbell

of Tennessee, and subsequently took up his residence in that state, and engaged in stock raising, in which he was very successful.

EWING, John, an American clergyman, born in Nottingham, Md., June 22, 1732, died in Philadelphia, Sept. 8, 1802. He was educated in the college of New Jersey, was tutor in that college and instructor of the philosophical classes in the college of Philadelphia, and in 1759 became pastor of the first Presbyterian church in Philadelphia. In 1773 he visited England, and had interviews with Dr. Robertson, Lord North, and Dr. Johnson; the last of whom, affirming that the Americans were as ignorant as rebellious, said to Dr. Ewing, "You never read. You have no books there." "Pardon me," was the reply, "we have read the 'Rambler.'" When the college of Philadelphia was changed in 1779 to the university of Pennsylvania, Dr. Ewing was placed at its head as provost, and remained in this station together with his pastorate till his death. He was vice president of the American philosophical society, and made several contributions to its "Transactions." His collegiate lectures on natural philosophy (2 vols., 1809) and a volume of sermons were published after his death.

EWING, Thomas, an American statesman, born in Ohio co., Va., Dec. 28, 1789, died at Lancaster, Ohio, Oct. 26, 1871. In his 20th year he left home and worked in the Kanawha salt establishments, until he had laid up money enough to pay for the farm which his father had purchased in 1792, in what is now Athens co., Ohio, and enabled himself to enter the Ohio university at Athens, where he graduated in 1815. He studied law in Lancaster, Ohio, was admitted to the bar in 1816, and practised with great success in the state courts and the supreme court of the United States. In March, 1831, he took his seat in the United States senate. He spoke against confirming the nomination of Van Buren as minister to Great Britain, supported the protective tariff system of Clay, and advocated a reduction of the rates of postage, a recharter of the United States bank, and the revenue collection bill known as the "force bill." In 1834, and again in 1835, as a member of the committee on post offices and post roads, he presented a majority report on abuses in the post office which resulted in the reorganization of that department. He opposed the removal of the deposits from the United States bank, and on Dec. 21, 1835, introduced a bill for the settlement of the Ohio boundary question, which was passed March 11 and June 15, 1836. During the same session he brought forward a bill, which became a law, for the reorganization of the general land office; and on several occasions he opposed the policy of granting preemption rights to settlers on the public lands. He spoke against the admission of Michigan, and presented a memorial for the abolition of slavery and the slave trade in the District of Columbia, which he insisted ought to be re-

ferred, though he was opposed to granting the prayer of the memorialists. In July, 1836, the secretary of the treasury issued what was known as the "specie circular," directing receivers in land offices to accept payments only in gold, silver, or treasury certificates, except from certain classes of persons for a limited time. In December Mr. Ewing brought in a bill to annul this circular, and another declaring it unlawful for the secretary to make such discrimination, but the bills were not carried. His term expired in March, 1837, and he resumed the practice of his profession. In 1841 he was appointed secretary of the treasury by President Harrison, and retained that office under President Tyler. His first official report proposed the imposition of 20 per cent. *ad valorem* duties on certain articles for the relief of the national debt, disapproved the independent treasury act passed the preceding year, and urged the establishment of a national bank. He was requested to prepare a bill for the last purpose, which was passed with some alteration, but was vetoed by the president. Mr. Tyler thereupon indicated a plan for a bank of moderate capital for the regulation of exchanges, and at his request Mr. Ewing helped to frame a charter, which was immediately passed and in turn vetoed. Mr. Ewing, with all the other members of the cabinet except Mr. Webster, consequently resigned (September, 1841). On the accession of Gen. Taylor to the presidency in 1849, he took office as secretary of the newly created department of the interior, which he organized. Among the measures recommended in his first report, Dec. 8, 1849, were the extension of the public land laws to California, New Mexico, and Oregon, the establishment of a mint near the California gold mines, and the construction of a road to the Pacific. On the death of Taylor and the accession of Fillmore, in 1850, Mr. Corwin became secretary of the treasury, and Mr. Ewing was appointed by the governor of Ohio to serve during Corwin's unexpired term in the senate. In this body he refused to vote for the fugitive slave law, opposed Clay's compromise bill, reported from the committee on finance a bill for the establishment of a branch mint in California, and advocated a reduction of postage, river and harbor appropriations, and the abolition of slavery in the District of Columbia. In 1851 he retired from public life. Among the most elaborate of his written professional arguments are those in the cases of *Oliver v. Piatt et al.*, involving the title to a large part of Toledo, Ohio; the Methodist church division; the McIntire poor school v. Zanesville; and the McMicken will, involving large bequests for education. In February, 1861, he was a delegate from Ohio to the peace conference in Washington.—THOMAS, his son, born at Lancaster, Ohio, Aug. 7, 1829, was chief justice of Kansas in 1861, served in the civil war, and received the brevet of major general of volunteers in 1864.

EXARCH (Gr. *ἐξαρχος*, leader), in the eastern Roman empire, an ecclesiastical or civil dignitary invested with extraordinary authority. At first exarchs were officers delegated by the patriarch or synod to visit a diocese for the purpose of restoring discipline. The exarch was also the superior of several monasteries, in distinction from the archimandrite, who was the superior of one, and was of a rank inferior to that of patriarch and superior to that of metropolitan. In the modern Greek church the exarch is a legate *a latere* of the patriarch. He visits the provinces to investigate ecclesiastical cases, the differences between prelates and people, the monastic discipline, the administration of the sacraments, and the observance of the canons; and he usually succeeds to the patriarchate.—As a civil officer, the exarch was a viceroy intrusted with the administration of one or more provinces. This title was given to the prefects who from the middle of the 6th century to the middle of the 8th governed that part of Italy which was subject to the Byzantine empire. They were instituted after the reconquest of Italy from the Ostrogoths by Narses, to oppose the progress of the Lombards, then threatening to occupy that country. They held their court at Ravenna, and combined civil, military, judicial, and often ecclesiastical authority. They appointed dukes as vice governors for several parts of Italy. The exarchate was destroyed by the Lombards in 752. When Pepin of France conquered Ravenna, it was ceded to the pope. The title of exarch for high civil and military officers remained in the West till the 12th century.

EXCELLENCY, a title borne originally by the Lombard kings, and then by the emperors of the West from Charlemagne to Henry VII. It was adopted in the 15th century by the Italian princes, who exchanged it for that of highness (*altrezza*) after the French and other ambassadors had been permitted to assume it. In France it became about the middle of the 17th century a common title for the highest civil and military officers; and in Germany it was given also to doctors and professors in universities. It is the title of every nobleman in Italy; in France, a duke is addressed as *excellence*, and a prince as *altesse*. It is the usual address of foreign ministers and of the governors of British colonies. The president of the United States is sometimes called his excellency the president, but there is no legal sanction for this, the founders of the government having decided after discussion to bestow no title upon the president. A committee of the senate reported in favor of the style "his highness," but the house opposed any title besides those expressed in the constitution. Massachusetts is the only state whose constitution grants the title of excellency to its governor.

EXCELMANS. See EXELMANS.

EXCHANGE, a gathering place for the transaction of business. In Venice, Genoa, and other

Italian cities, regular commercial gathering places existed at an early day. The modern institution of exchanges, however, dates more particularly from the 16th century. In continental Europe the name *Börse* in German, *bourse* in French, and *birzha* in Russian, originated from the belief that the first gathering of the kind took place in the early part of the 16th century at Bruges, in Flanders, in the house of a family of the name of Van der Beurse. According to another tradition, the first exchange was held at Amsterdam in a house which had three purses hewn in stone over the gates, thus accounting for the use of the word *bourse*. Previous to the latter part of the 16th century the London merchants used to meet without shelter in Lombard street. Sir Richard Gresham, having seen the covered walks used for exchanges abroad, contemplated erecting a similar building in London. The scheme was carried into effect by his son Sir Thomas Gresham, who offered to erect a building if the citizens would provide a plot of ground. The site north of Cornhill, in the city of London, was accordingly purchased in 1566 for about £3,600. On Jan. 23, 1570, Queen Elizabeth caused it to be proclaimed the "Royal Exchange." This structure was destroyed in the great fire of 1666. The new exchange was commenced at the end of 1667, and publicly opened for business Sept. 28, 1669. This building, which was 210 ft. by 175, cost nearly £80,000, and was destroyed by fire Jan. 10, 1698. The corner stone of the present royal exchange was laid in 1842, and the building was opened Oct. 28, 1844, by Queen Victoria. It is an imposing edifice, embellished with many statues, and cost £180,000. The area appropriated to the meetings of the merchants is 170 ft. by 112, of which 111 ft. by 53 is uncovered. Here the English, German, Greek, Mediterranean, and other foreign merchants, all have their appropriate places and corners, and meet daily for the transaction of business. The busiest hour is from 3½ to 4½ P. M. The two great days on 'change are Tuesday and Friday, when an extra meeting for transactions in foreign bills of exchange takes place previous to the regular meeting, which is attended by the principal bankers and merchants of London, and which derives great importance from the immense business transacted within about half an hour. The whole foreign commerce which centres in London is here concentrated in a handful of bills of exchange. There is much less excitement than at the general exchange. A few brokers pass between the bankers and merchants, and the bills are bought and sold almost in a whisper.—The most celebrated continental exchange is the bourse of Paris, which was inaugurated in 1824. The building has the shape of an ancient peripteral temple, and is calculated to hold more than 2,000 persons. The Paris exchange is a combination of a stock and bill exchange, and confines itself chiefly to these branches of business. The St. Petersburg exchange, built between

1804 and 1810, approaches the Paris bourse in splendor. The Hamburg exchange resembles it both in shape and grandeur. The exchange of Amsterdam was finished in 1613, and is an edifice of great magnitude. The bourse of Antwerp, one of the oldest and most remarkable of Europe, which was chosen by Sir Thomas Gresham as a model for the first royal exchange in London, was totally destroyed by fire, Aug. 2, 1858, and has since been rebuilt in the rue de la Bourse. A large portion of the commerce of the world was transacted in it for a considerable time. At Amsterdam, Hamburg, Vienna, Constantinople, St. Petersburg, Berlin, Frankfort, &c., the exchanges are numerous attended, but the exchange of London stands unrivalled in Europe for the magnitude of its transactions.—The merchants' exchange in New York was founded in 1817. Its first building, in Wall street, between William and Pearl streets, was built of Westchester marble, three stories in height, with the city post office in the basement, and insurance and other offices on the third floor. It was opened in 1827, and was destroyed by the great fire of Dec. 16, 1835. The second exchange, on the same site, was built of Quincy granite, at a cost, including the value of the ground, of \$1,800,000. It was subsequently sold to the general government to be used as a custom house. The present exchange has an imposing marble front in Broad street, near Wall street, with entrances also in Wall and New streets. Buildings for similar purposes, and generally of large size and great cost, exist in all the principal cities of the United States.

EXCHANGE, Bill of, in commercial transactions, a written instrument designed to secure the payment of a distant debt without the transmission of money, being in effect a setting off or exchange of one debt against another. This important instrument is of modern origin. It was not because its use was not perceived that it was unemployed in ancient commerce, but because its basis is mercantile integrity, which never existed till a recent period in trading communities to a sufficient extent to warrant putting money or other valuable commodities at risk upon so frail a security. Thus we have evidence in the case of the Athenian banker, which is the subject of one of the discourses of Isocrates, that the convenience of such an exchange as is now usual among merchants was well enough understood then, but it was deemed necessary to take security for the payment of the bill. Transactions of the same kind have doubtless occurred at all periods where parties have had sufficient confidence in each other; but that they were unfrequent is manifest from the silence of the Roman law in respect thereto. It is said that the Jews of the middle ages first introduced bills of exchange into ordinary use, and this is entitled to credit, inasmuch as the frequent migrations and spoliations to which they were subjected in those times of persecution made

an easy transmission of wealth and its safe keeping in foreign countries almost a necessity. Of course the bills drawn by them were upon persons of their own race. The negotiation of bills of exchange by law can be traced back about 4½ centuries, the earliest being an ordinance of the city of Barcelona in 1894 respecting the acceptance of bills of exchange. An edict of Louis XI. in 1462 is the first notice of the subject in the laws of France. (See Kent's "Commentaries," vol. iii., p. 72, note.)—In form, a bill of exchange is an order or request addressed by one person to another directing the payment of money to a third person. The first is called the drawer; the second is the drawee until the bill has been presented and accepted, and then he is called the acceptor; the third is the payee. But sometimes the bill passes through several hands, which may be either by successive indorsements specifying to whom payment is to be made, or by what is called an indorsement in blank, by which is meant that the payee, or the subsequent holder to whom the bill has been indorsed, merely writes his own name on the bill, which is equivalent to making it payable to bearer. The most important incident of a bill of exchange is its negotiability, that is to say, facility of transfer from one person to another. For this purpose it is essential that the engagement of the several parties, whether drawer, acceptor, or indorser, should be disentangled from all matters not appearing upon the face of the bill. This, therefore, is the general rule, subject to some exceptions which will be presently mentioned. Equally necessary is it that the bill itself should by its terms involve no uncertain contingency, as to depend upon an event that may not happen, or upon some condition which may be the subject of controversy. Hence it has been uniformly held that it must be payable at a fixed time, that is to say, at some period which is certain; but it may be so far contingent as to depend upon an event which must inevitably happen, though the precise time cannot be specified. Thus a bill may be payable a certain time after the death of a particular person; but it would not be a good bill if made payable after the arrival of a certain vessel. The one event is certain to happen at some period, though it may be remote; the other may not happen at all. Again, a bill of exchange must be expressed to be for the payment of money only, and would not be good if payable in cattle or other species of property, nor even if made payable in bank bills, though it is held in some cases that if payable in currency it is a good bill, as this implies specie or its equivalent. When it is said that a bill is not good if subject to any contingency or payable otherwise than in money, it is intended merely that it is not negotiable with the legal effect which appertains to a bill drawn in the prescribed form. It may nevertheless constitute a valid contract between the original parties, and may even be

transferred so as to vest in the assignee the same right which the payee would have had against the drawer or acceptor. The transfer in such case will, however, be subject to the same rules that apply to other personal contracts usually denominated *choses in action*. In other words, the transfer is itself a contract; and although it is not necessary that it should be in writing, yet it derives no aid from mercantile usage respecting the indorsement of bills. The delivery of a note not negotiable may give an ownership if so designed, and this is so in respect to a bond or other contract. But by the common law there was this limitation, that the right of the holder could be enforced only in the name of the original obligee, it being a rule that a chose in action was not assignable. In equity, however, the right of the assignee was recognized, and so to a certain extent it came to be in the common law courts, the formality of using the name of the assignor in a suit brought upon such chose in action being all that is retained of the old strictness. In most of the states even this has been abrogated, and the real party in interest, by which is meant whoever has the actual ownership, may be the party to the action. Again, such transfer confers no greater right than the original payee or obligee had, and is subject to any defence, legal or equitable, which the other parties had against such payee or obligee prior to actual notice of the assignment, or what in law would be tantamount thereto. The bill, or rather contract, as it should be termed in the case supposed, is itself also subject to one important rule distinguishing it from a proper bill of exchange, viz., that it does not import a consideration unless expressed. If, therefore, no consideration is specified, parol evidence thereof will be necessary, as the rule of the common law is that a consideration is an essential requisite of a contract; but parol evidence will be inadmissible in all those cases in which by statute it is required that the contract should be in writing, as when the contract is not to be performed within one year, or when it is to answer for the debt of another person, &c. It will now be understood what is the negotiability above referred to as being the peculiar incident of a bill of exchange. The bill, in the first place, imports *per se* to have been given for value, even if it does not contain the usual clause "for value received," which, though generally inserted, is mere surplusage; and every successive holder who has received it before it was due, in the regular course of business, for a valuable consideration, is entitled to enforce it according to the terms of the obligation expressed therein, without regard to any transactions between the original parties. To this rule there are some exceptions, as when the bill was given for a gaming debt or when usury is involved, in which cases the bill is declared to be absolutely void by statutes in England, which have been generally reenacted in the United States. When there

has been fraud in the transaction to which the bill relates, which would have been a defence as between the original parties, the rule is that a *bona fide* holder for value is not affected thereby; with however this limitation, that the bill has been received not only without knowledge of the fraud, but without such notice of the circumstances as should have induced suspicion and inquiry. If the bill at the time of transfer has become due, this is in law deemed sufficient to call for inquiry, and the indorsee in such case takes the bill subject to whatever defence there would have been against the party from whom he received it. When a bill has been stolen or lost, and has been put into circulation again, a *bona fide* purchaser is entitled to enforce it against all previous parties, provided there were no circumstances that should have led him in the exercise of ordinary prudence to inquire into the title of the party from whom he received it. It will in such a case be a question of fact whether due diligence has been used by the holder, and the burden of proof is imposed upon him, upon its being shown that the bill had been stolen or lost. The question in such case would be between the person who had lost the bill or from whom it had been stolen, and the person who had received it after the theft or loss. The liability of the original parties is not affected. —Bills of exchange are of two sorts, foreign and inland; the former being drawn by a merchant in this country upon another residing abroad, or by a foreign merchant upon one residing here; the latter when both drawer and drawee reside in the same country. The principal rules relating to bills of exchange grow out of mercantile usage respecting foreign bills; but by statute in England and the United States both are now put upon the same footing, with the exception only that damages are allowed upon foreign bills which come back protested for non-acceptance or non-payment. By statute in England and the United States, promissory notes are made negotiable in like manner as inland bills of exchange. The same principles therefore, in respect to negotiability and the legal incidents thereof, apply to both.

EXCISE, a term employed to designate a particular form of taxation. Excise taxes or duties are distinguished from customs in being such as are imposed upon domestic commodities, chiefly manufactures, such as glass, paper, spirits, &c., while customs are duties levied upon merchandise imported or exported. Both kinds are included under the common term imposts. Excise duties were first imposed in Great Britain by the long parliament in 1643, but a number of articles of foreign production were included in the act, as tobacco, wine, sugar, &c., which were charged with a duty in the hands of the retailer in addition to what had been paid on importation. Since that time they have been regularly continued, but with modifications from time to time as to the

articles subject to the duty and the rate of charge. The articles of foreign growth and manufacture are now transferred to the department of customs. At the present time excise duties are nearly all collected on fermented and distilled liquors and chicory, though license duties are also classed with the excise taxes. For the year ending March 31, 1872, the excise duties collected in the United Kingdom amounted to £23,886,064, of which £6,670,955 were collected on malt, £12,274,596 on spirits, and £3,781,979 for licenses.—Excise duties have not been generally levied in the United States, but the national government has relied upon customs as its principal source of revenue. An excise duty on the manufacture of spirits during Washington's administration led to what was called the whiskey insurrection in Pennsylvania, which was soon suppressed, but the tax was not continued. Others were imposed in 1813, but repealed in 1817. After the breaking out of the civil war in 1861 it became necessary to resort to every available source of income, and an elaborate system of excise duties was established, designed in some form to reach nearly every species of manufacture. The most of these duties have successively been abolished, but those on spirits and tobacco are retained. For the purposes of comparison with the excise duties collected in Great Britain in 1872, the following figures are given. The duties collected on the manufacture and sale of distilled spirits for the year ending June 30, 1872, were \$49,475,516 86; on fermented liquors, \$8,009,969 72; on tobacco, \$18,674,569 26.—The relative advantage of excise duties and customs has been much debated. The latter are evaded to a large extent by smugglers, but the excise duties are also evaded, particularly in respect to spirits. This was strikingly illustrated in the United States, where it was found that a tax of \$2 a gallon on the manufacture of whiskey produced less revenue than one of 50 cents. Excise duties are also objected to on the same ground with an income tax, namely, that they expose the manufacturer's private operations. Another objection that has tended to make them more obnoxious than any other is the arbitrary manner of enforcing them, which is felt to be an interference with private liberty and independence, which the common law has sedulously protected. It is supposed that in this matter of collecting its revenue the government considers itself entitled to dispense with all the ordinary protections to individual right and liberty, and to provide the most unjust and arbitrary proceedings at discretion. This was illustrated in a very remarkable manner in the recent case of Henderson, in which it was held by the majority of the United States supreme court that a *bona fide* purchaser of liquors stored in a government warehouse, who had paid in full all dues, might afterward have the liquors seized in his hands and forfeited to the government because a former owner had at

one time had a design to evade payment of the duties upon them; a purpose of which the purchaser was wholly ignorant. (14 Wallace's Reports, 44, 64.)

EXCOMMUNICATION (Lat. *ex*, out of, and *communicatio*, intercourse), the cutting off a member of a religious society from intercourse with the other members in things spiritual. This penalty was familiar to the pagan nations of antiquity, as well as to the Jews; and from them it passed into use among Christians. In Greece, persons guilty of enormous crimes were given over to the Furies with certain terrible forms of imprecation. There were three kinds of excommunication among the Greeks. By the first, the criminal was excluded from all intercourse with his own family; by the second, he was forbidden to approach any temple, or to assist at any sacrifice or public rite; by the third, it was forbidden to give him shelter, food, or drink. The Romans borrowed the rite from the Greeks, and the formulas *sacris interdiceret*, to forbid the use of sacred things, *divis devovere*, to devote one to the Furies, *exsecrari*, to curse, &c., have much the above meaning. According to Cæsar, the highest punishment inflicted by the druids, among Celtic nations, was to exclude an offender from all their religious rites. Such a man was considered by all as wicked and an enemy of the gods; he was shunned even by his own kindred, denied all justice and hospitality, and lived and died in infamy. The Semitic races, in ancient and modern times, have practised excommunication, and it is now in use wherever Mohammedanism extends. We have the testimony of Josephus that excommunication was practised among the Jews, and he notes the extreme rigor with which the Essenes applied it. Among them, the criminal who was thus put out of the society of his brethren not only could hold no communication with them even for the necessities of life, but was bound by vow not to ask food or shelter from strangers. Thus driven to subsist on herbs and hide in caves, they eked out a miserable life, which often ended in a tragic death. There were three kinds of excommunication among the Jews. The mildest form consisted in a temporary exclusion from religious and social intercourse for 30 days. If during this interval the culprit did not repent, another term of 30 days was added, which was lengthened to 90 days if he still remained obdurate. If he persisted at the end of that time, he was visited with the more severe and solemn form of excommunication, that is, publicly cast out of the synagogue, with awful execrations taken from the law of Moses. When this penalty and all other human means had been tried in vain, he was given over to the divine judgment as an irreclaimable sinner.—In the early Christian church we find excommunication practised by St. Paul, and enjoined both by him and by St. John. In the post-apostolic ages it was the universal custom both in the East and West,

modified only from the Jewish practice in accordance with the requirements of Christian belief and worship. The lowest degree consisted in the refusal of eucharistic communion; the next in exclusion from the church and the liturgical service; the third in total exclusion, by solemn denunciation, from membership with the church, and from all intercourse, social or religious, with Christians. This highest degree of excommunication was accompanied in some instances by an awful form which explains the *anathema maranatha* of St. Paul. When the person excommunicated was not only guilty of apostasy or heresy, but one who sought to draw the multitude after him, a prayer was made by some churches that God should come down in judgment and cut the seducer off, as in the cases of Julian the Apostate and Arius.—In the Latin church, since the publication of Gratian's *Decretum*, and the regular adoption of canon law, two kinds of excommunications have been described by canonists, the minor and the major. The former excluded the offender from the use of the sacrament and the benefit of certain ecclesiastical privileges and immunities. It was incurred for sins that were not public, or for communicating with persons under the solemn ban. The major excommunication cut the offender off not only from church membership, but from social intercourse with Christians. He was solemnly and by name called *vitandus*, "to be shunned by all." As heresy, public apostasy, and great crimes by which excommunication was incurred, came early to be recognized as state offences and misdemeanors punishable by the laws of the empire, so it was soon decreed by statute that the excommunicated should incur privation of office and rank, loss of civil rights, and forfeiture of property. These dispositions became more or less a part of the common law of western as well as of eastern Christendom. When the Roman empire was restored in Charlemagne, and the German emperors were wont to receive the imperial crown from the pope, public excommunication pronounced against them was held to involve a forfeiture of their crown. This was also held to be the case with sovereigns whose kingdoms were fiefs of the see of Rome. It was against such high offenders that the major excommunication was fulminated, with the awful ceremonies mentioned in history. In the present discipline of the Roman Catholic church the excommunication of sovereigns is reserved to the pope, and has been very rarely practised since the 16th century. In 1570 Pope Pius V. excommunicated Queen Elizabeth of England, and formally absolved her subjects from their allegiance. In the modern Greek church excommunication cuts off the offender not only from the "communion of saints," but from all intercourse, religious or social, and consigns him, living and dead, to the evil one.—The power of excommunication was maintained by the reformers, who claimed it as a prerogative

of the Christian community, while the Roman Catholic and eastern churches vested it in the episcopal order. In the church of England the vigorous provisions of the old canon law were for the most part kept in force after the reformation, and were a part of the law of the land until the reign of George III., when (52 George III., c. 127) excommunications and the consequent civil effects were done away with, except for certain specified cases. When the person excommunicated for the offences mentioned in the act allows six months to pass without submitting to correction, the bishop certifies this contumacy to the court of chancery, which issues its writ to the sheriff. The severest penalty enforced is six months' imprisonment. In Scotland, when the lesser excommunication has failed, the delinquent is subjected to the greater, and the faithful are warned to avoid all unnecessary intercourse with him. In the Protestant Episcopal church certain offences entail the privation of holy communion, while "great heinousness of offence" is followed by loss "of all privileges of church membership." The Methodist Episcopal church vests the power of excommunication in the minister, after a trial before a jury of peers of the accused. Excommunication is inflicted among the Presbyterians, Congregationalists, and Baptists by the church, according to the view of the early reformers.

EXCRETION (Lat. *excernere*, *excretum*, to purge), the elimination of waste or effete matters from the living body. There is evidence that during the vital processes every exertion of activity by a living tissue or organ is necessarily accompanied by a molecular change in its chemical constitution. So intimate is this connection between the alteration of substance in a living organ and its physiological action, that it is impossible to say with certainty which of these two is the cause and which the effect. The fact is however that, as we have said above, every manifestation of vital activity involves a change in the immediate constitution of the active organ. The consequence of this is that, in the living body, new substances, the result of its internal disintegration, are constantly making their appearance. These substances, termed excrementitious matters, must not be allowed to remain and accumulate; for in that case the constitution of the organs would become so changed from their original condition that they would be no longer capable of performing their proper functions. These matters must therefore be gotten rid of, or eliminated from the body, as fast as they are produced; and the process by which this is accomplished is called excretion. The mechanism of this process is as follows: The excrementitious matters produced in the solid tissues are absorbed from them by the blood, carried by the circulation to some organ adapted to the purpose, exhaled or exuded in the gaseous, fluid, or semi-fluid form, and thus discharged from the

body. The two principal excretory organs are the lungs and the kidneys. The venous blood in passing through the lungs discharges the carbonic acid which it has absorbed from all the vascular parts of the body, and returns to the left side of the heart purified and renovated. The blood which passes through the circulation of the kidneys exhales, together with its watery parts, urea, creatine, creatinine, and the compounds of uric acid; nitrogenous crystallizable matters produced in various parts of the system, and which form the important ingredients of the urine. Thus the blood constantly relieves the solid tissues of the excrementitious matters produced in their substance, and is itself relieved of them by passing through the excretory organs. Should this process from any cause be suspended or retarded, the accumulation of excrementitious matters in the body would soon make itself felt by a derangement of the health, and especially by its injurious effects upon the nervous system. Pain, loss of appetite, confusion of mind, disturbance of the special senses, and in extreme cases convulsions, coma, and death, result from the arrest of excretion, which is therefore no less important to life than nutrition.

EXECUTION, in law, the final process to enforce the judgment of a court, according to the old maxim, *executio est fructus et finis legis*. In its larger application it includes the process of sequestration formerly used by the court of chancery to carry into effect its decrees, attachments for contempt of court, and process in summary proceedings, as upon mandamus and the like; but in its ordinary acceptation it is a writ issued to enforce a judgment in a suit or action in a court of common law. It is unnecessary to speak of the execution in the various real actions which have become obsolete. In England the actions for recovery of real estate, whether corporeal or incorporeal, are, by statute 3 and 4 William IV., c. 27, now limited to ejectment, *quare impedit*, and actions for dower. The first is the ordinary mode of trying a title to lands, and the execution upon a judgment of recovery is a writ of possession, which in form is directed to the sheriff, commanding him to deliver to the plaintiff the possession of the lands so recovered. *Quare impedit* is an action by which the right to a benefice is determined, and takes its name from a clause in the old Latin form of the writ by which the defendant was commanded to appear in court and show the reason why he hindered the plaintiff from presenting a proper person to a vacant office in a church. Upon judgment in favor of the claim, the execution is a writ directed to the bishop commanding him to admit the person nominated by the prevailing party. The action also lies for an office in eleemosynary institutions, as hospitals and colleges, which are endowed for the support of their inmates; and the execution in such cases is the same, except that it will be directed to the corporate officers or

persons who have the control of the institution. In respect to lay officers, as they are called in distinction from ecclesiastical and eleemosynary, the mode of proceeding is by *quo warranto* or *mandamus*. The former was strictly a proceeding in behalf of the crown against any one who had intruded into an office, but is now allowed by statute in England (9 Anne, c. 20) to determine disputes between private parties claiming an office adversely to each other. The proceeding in that case, although in form in behalf of the crown, yet is stated to be on the relation of the person prosecuting, and upon judgment in his favor execution issues to remove the intruder. *Mandamus* is a remedy where there is a refusal to admit the claimant to an office, or where he has been wrongfully removed. If the claim be established, a peremptory *mandamus* issues, directed to the defendant, commanding him to admit or restore the claimant, who is in this case, as well as in the proceeding by *quo warranto*, called the relator. This is, however, not strictly an execution, as if not obeyed it must be enforced by another process called an attachment. In other actions, where the subject is an injury to real estate, usually the remedy is a recovery of damages; but in some instances specific relief is given, as in an action for a nuisance there may be a judgment that it be abated, and the execution in such case follows the judgment. So in some personal actions, formerly, there might be judgment for the delivery of the specific thing, as in detinue, which was brought to recover possession of chattels, and the judgment was enforced by an execution called a *distingas*, which commanded the sheriff to make distress of any goods of the defendant until he complied with the judgment; but if he still refused, there could only be an assessment of the value of the thing recovered, and a sale of defendant's property to pay the same. In the action of replevin, which was originally limited to the recovery of property which had been wrongfully distrained for rent, the writ by which the action was commenced directed the sheriff to replevy, that is, take the property in question, and deliver it to the plaintiff upon pledges to prosecute. If the defendant succeeded in the action, the judgment is that he have return of the property, or if he elects, he may have an assessment of the value, and recover that amount as damages. In the former case the execution is for redelivery of the property, in the latter merely for the damages. —Before proceeding to the consideration of other actions, it will be proper to state the modifications which have been made in the United States in respect to those already noticed. All the common-law real actions are generally abolished except ejectment, which, in a simplified form, is used for the trial of title to land in all cases. *Quare impedit* is not retained, nor is there any action for the recovery of an office except the proceedings by

quo warranto or *mandamus*. The action of detinue has been generally abolished, and the action of replevin has been extended to all cases of the wrongful taking or wrongful detention of personal property. In the latter action the plaintiff, instead of an actual replevy of the goods, may arrest the defendant and compel him to give bail, and the final judgment in such case will be for damages; and so the defendant, if he succeeds in a case where the goods have been replevied, may take judgment for the value, the execution being in either of these cases merely for damages. —We now come to the ordinary actions in which there is judgment for a money demand. At common law there are three forms of execution upon such a judgment: 1, a *feri facias*, so called from the terms of the writ by which the sheriff is commanded that of the goods and chattels of defendant he cause to be made the amount of the debt or damages recovered; 2, *elegit*, which is a writ given by an ancient statute (18 Edward I., c. 18), whereby, if the plaintiff elected, possession of the goods and chattels of defendant was delivered to plaintiff under an appraisal of the value thereof, which to that extent was to be a satisfaction of the judgment; but if not sufficient, then possession of one half of the freehold lands of defendant was also to be delivered until from the rents and profits thereof the judgment should be paid; 3, a *capias ad satisfaciendum*, which is a writ directed to the sheriff commanding him to take the body of the defendant, and keep the same until satisfaction of the debt. The course of proceeding upon this writ was to imprison the defendant in the debtors' jail, of which the sheriff had in law the charge. (See DEBTOR AND CREDITOR.) Having traced the origin of the terms applied to executions, we shall limit ourselves to a brief explanation of the legal incidents as now prescribed by statute in the United States. The two forms of execution are the *feri facias* and the *capias ad satisfaciendum*, which have been already explained, and which are designated by the abbreviated terms *fi. fa.* and *ca. sa.* The *fi. fa.* is a writ directed to the sheriff by which he is commanded to make the amount of the judgment by sale of the defendant's goods and chattels, or if these should not be sufficient, then of the lands of which he was seized on the day when the judgment was docketed. An exemption is made of certain property from levy under execution, viz.: household furniture, necessary provisions and fuel for the use of the family for a specified time, stock in trade, necessary wearing apparel, bedding, &c., tools and implements to an amount named, a family Bible, family pictures, school books, the family library, &c., and in addition, a lot and building occupied as a residence by the debtor, being a householder and having a family, to a value named, which in most states is \$1,500 or upward. (See *FERI FACIAS*.) The *ca. sa.* is the old form of

execution against the person of the defendant, and since the abolition of imprisonment for debt can be issued in a few cases only. (See **BANKRUPT, and DEBTOR AND CREDITOR.**)

EXECUTOR, the person appointed to carry into effect the directions contained in a last will and testament. By the common law of England, or rather by the law as administered in the ecclesiastical courts, an infant of the age of 17 was qualified to act as executor. Prior to that age, letters of administration were granted to some other person *durante minore etate*; but by statute 38 George III., c. 87, such administration must now continue until the person named as executor has reached the age of 21. A married woman cannot act as an executrix without the assent of her husband, inasmuch as he is responsible for her acts. When executors are not named in a will, or are incompetent, or refuse to act, letters of administration with the will annexed may be issued, under which the same powers may be exercised that could have been by competent executors duly appointed. An executor *de son tort*, as he was formerly called, i. e., one who intermeddled with the estate without having lawful authority, was liable to the extent of any assets which he might have appropriated to be sued as an executor of his own wrong, but was not entitled to institute a suit as executor. The doctrine of executor *de son tort* can scarcely be said to be recognized in America, but summary remedies are given against intermeddlers. (See **WILL.**)

EYELMANS, or **Exelmans**, **Bemy Joseph Isidore**, count, a French general, born in Bar-le-Duc, Nov. 18, 1775, killed by a fall from his horse in July, 1852. He served first in Italy, became an aide-de-camp of Murat, went with him to Germany, and was made colonel after the battle of Austerlitz, and brigadier general in 1807, after that of Eylau. He accompanied Murat in 1808 to Spain, where he was made prisoner and carried to England. He made his escape in 1811 and rejoined Murat, then king of Naples. When disagreement arose between Murat and Napoleon, Exelmans returned to France, and served in the Russian campaign with the rank of general of division. He retained his position in the military service after the first restoration, but resumed his duties in the army of Napoleon upon his return from Elba, and was raised to the peerage. He did not take part in the battle of Waterloo, being under the command of Grouchy. Under the second restoration he was in exile till 1819. He was restored by Louis Philippe to the chamber of peers, and denounced in that body the execution of Ney as an "abominable assassination." Under the presidency of Louis Napoleon he was made grand chancellor of the legion of honor, marshal of France, and senator.

EXETER, a town and one of the county seats of Rockingham co., New Hampshire, situated on Exeter river, a branch of the Piscataqua, and on the Boston and Maine railroad, 12 m.

S. W. of Portsmouth; pop. in 1870, 8,487. The falls at this point, which furnish good water power, are the head of tide water and the limit of navigation for small vessels. The principal village, built around the falls on both banks of the river, occupies a plain, and is laid out with wide streets shaded with elms. Besides the state courts for the county, sessions of the United States circuit and district courts are held here. The Exeter manufacturing company, incorporated in 1829, has more than 10,000 spindles in operation, and produces about 2,000,000 yards of sheetings annually. It has just erected another mill of equal capacity. The wool business is one of the principal branches of industry and trade in the place, being carried on by several large establishments. There are also several manufactories of carriages, 1 of drain pipe, 3 of harnesses, 3 grist mills, 1 iron foundry, 1 planing mill, 1 saw mill, 1 machine shop, a national bank, and 2 saving institutions. The town is chiefly noted as the seat of Phillips academy, founded in 1781 by John Phillips, LL. D., who bequeathed to it a large portion of his estate. It is one of the most celebrated schools for preparing boys for college in the country, and in 1872 had 4 instructors and 162 students. The original building, in which some of the most famous men of the country were educated, was burned in 1870; a new one was completed in 1872. The Robinson female seminary, organized in 1869 with an endowment of \$300,000, has a collegiate department, and in 1872 had 9 instructors and 252 students. Exeter contains several public schools, a town library of 3,428 volumes, a weekly newspaper, and 7 churches. It was settled in 1688, and suffered severely during the Indian wars from 1690 to about 1710. During the revolutionary period it was the capital of the state and the headquarters of its military operations.

EXETER, a city, port, and parliamentary borough of England, capital of Devonshire, and a county in itself, on the Exe, 10 m. from its mouth in the English channel, and 159 m. W. S. W. of London; pop. in 1871, 34,646. It is 194 m. from London by the Great Western railway, and is the point at which railways centre from South Devon, North Devon, Salisbury, and Exmouth. The Exe is here crossed by a handsome stone bridge leading to the suburb of St. Thomas. The city, standing on a steep acclivity, has two wide principal streets, which cross each other at right angles near its centre. It is generally well built, has many fine squares and terraces and ancient houses, and in its suburbs and environs are numerous elegant villas. It was formerly strongly fortified, but its exterior wall is now in a ruinous state, and a part of the rampart has been converted into a promenade. On an eminence N. E. of the town is Rougemont castle, anciently the residence of the West Saxon kings, repaired by William the Conqueror. Exeter is the seat of a bishopric founded about 1050. Its cathedral, a magnificent building of cruciform shape, was begun

about the year 1100. Its entire length is 408 ft.; it has two Norman towers 130 ft. in height, ten chapels or oratories, and a chapter house. One of the towers contains an immense bell weighing 12,500 lbs., and the other has a chime of 11 bells. Among the numerous schools is a free grammar school founded by the citizens in the reign of Charles I., in which the sons of freemen are instructed gratuitously, and which has 18 exhibitions to either of the universities. Exeter has a theatre and various literary and charitable institutions. Its commerce is much less now than formerly, but it has some internal trade, and is an important corn and provision market. The river Exe is navigable for vessels of large burden to Topsham, 4 m. below Exeter; and by means of a

canal built in 1568, subsequently much enlarged, and one of the oldest in England, vessels of 400 tons burden can come up to the quay near the walls of the town. Serges and other woollen goods were formerly manufactured in this city and the neighboring towns to a large extent, and shipped to the continent and the East Indies; but the introduction of machinery and the lower price of fuel in the north of England have very much diminished this trade.—This city is of unknown antiquity, and is supposed to be the *Caer-Isc* of the Britons, and the *Iaca Damnoniorum* of the Romans. It was the capital of the West Saxons, and in the reign of Alfred in 876 it was surprised by the Danes. It was besieged and taken by William the Conqueror. In the civil war it es-

Exeter Cathedral.

poused the royal cause, was taken by the parliamentarians, was retaken by Prince Maurice, became the headquarters of the royalists in the west and the residence of Charles's queen, and in 1646 surrendered after a blockade to Fairfax.

EXHAUSTION (Lat. *exhaurire*, to draw out), a method of the ancient geometry, applied with success by Archimedes and Euclid, by which the value of an incommensurable quantity was sought by obtaining approximations alternately greater and less than the truth, until two approximations differed so little from each other that either might be taken as the exact statement. Thus the length of a circumference was sought by calculating the length of inscribed and circumscribed polygons, and increasing the number of sides until the lengths of the outer and inner polygon were sensibly the same, when that of the circumference could not differ sensibly from either. By this method the space between the polygons and the curve was ex-

hausted, as it were, and hence the term. Exhaustion is now interesting chiefly because it was one of the methods which led, in the 17th century, to the invention of the differential calculus.

EXMOUTH, a town of Devonshire, England, 10 m. S. E. of Exeter; pop. about 6,000. It is a celebrated sea-bathing place, and is beautifully situated on the E. side of the entrance to the estuary of the Exe, in an opening of the cliffs which surround the shore. The modern part of the town consists of detached villas and terraces surmounted by neat houses, and there are many pleasant promenades. A gradually sloping sandy beach below the town is the principal resort of bathers. There is a handsome parish church with a tower more than 100 ft. high. Fisheries constitute the principal occupation; and many of the women are engaged in lace making.

EXMOUTH, Edward Pellew, viscount, an English admiral, born at Dover, April 19, 1757,

died at Teignmouth, Jan. 23, 1833. He entered the navy at the age of 13, and first distinguished himself in the battle of Lake Champlain, Oct. 11, 1776. In 1782 he became a post captain, and from 1786 to 1789 he was stationed off Newfoundland. In 1793, commanding the frigate *Nymphé*, of 36 guns, he captured the French frigate *La Cléopâtre*, of equal metal, after a desperate battle. This was the first prize taken in the war, and Pellew was knighted. He was then employed in blockading the French coast. At Plymouth in 1796, by great bravery and presence of mind, he saved the lives of all on board a wrecked transport, leaving the ship himself just before it went to pieces. For this he was made a baronet, and received other honors. Meanwhile, in command of the *Arethusa*, 44 guns, he had fought a number of engagements with French vessels, being always victorious. He also commanded successively the *Indefatigable*, 49 guns, and the *Impétueux*, 78 guns. In 1802 he was elected to parliament, but in 1804 was again called to the naval service, promoted to rear admiral, and made commander-in-chief in the East Indies. In 1808 he was made vice admiral, and in 1810 was sent to command in the Mediterranean. In 1814 he was created Baron Exmouth of Canonteign, with a pension of £2,000, and in the same year was made a full admiral. During his command in the Mediterranean he concluded treaties with Algiers, Tunis, and Tripoli, for the abolition of Christian slavery. The dey of Algiers having violated his treaty, Exmouth sailed into the harbor of Algiers, Aug. 26, 1816, with 19 vessels, accompanied by a Dutch fleet of 6, and engaged the Algerine fleet and batteries at close quarters. After an action of seven hours, every Algerine ship and the arsenal and several other buildings were on fire. The dey conceded everything that was demanded, and signed a new treaty. In this affair Lord Exmouth received two slight wounds and had his clothes torn to shreds by the shot. About 1,200 Christian slaves were liberated, and on his return the admiral was made a viscount. He retired from public service in 1821.

EXODUS (Gr. *ἔξοδος*, departure), a book of the Bible, the second of the Pentateuch. It derives its name from the principal event recorded in it, the departure of the Hebrews from Egypt, and contains the history of that people from the death of Joseph until the building of the tabernacle. The researches of modern Egyptologists have thrown much light on the Biblical narrative. The land of Goshen, where the Hebrews had been permitted to settle, was east of the delta of the Nile, on the borders of Syria, and the places mentioned in connection with the exodus have been identified as follows: Rameses as the town Nashuta, in the E. part of the wady Tumilat; Succoth, the Thaubasium of the Romans, N. E. of Lake Timsah; Etham, the fortified wall on the Syrian frontier; Pi-hahiroth,

the modern Kalat Agrud, N. W. of Suez; Migdol, the place formerly called Kambysu, where the Persian monument stands; and Baalzephon as the Atakah mountains. The hieroglyphic inscriptions render it probable that the oppressors of the Hebrews were Seti I. and his son Rameses II., and that Merneptah was the Pharaoh of the exodus. (See *EGYPT*, vol. vi., pp. 461-'2.) They show also that the Hebrews had been employed to build temples, fortresses, and granaries; and several monuments depict them at work making bricks, with overseers standing by and sometimes beating them with rods. This does not necessarily lead to the conclusion that the Pharaohs of the period were reckless tyrants. They were severe military rulers, who foresaw that the Hebrews would make common cause with their kindred in Syria in case of an invasion. They strengthened accordingly the fortified wall on the borders, which the Pharaohs of the 12th dynasty had erected, and built new fortresses in Goshen, partly for protection against invasion and partly for keeping watch over the Hebrews. According to the monuments, the troops stationed here were chiefly Libyans, who were not likely to sympathize with the Hebrews. A treaty made by Rameses II. with the chief of the Khitas in Syria, found on a stele in the temple district of Karnak, provides for the extradition of fugitives escaping over the border. Merneptah's policy was to prevent the Hebrews from gathering into bodies too large to be controlled, which he effected by compelling them to labor in small detachments on the public works. His refusal to allow them to assemble for the purpose of worshipping their God in the wilderness was prompted by fear of some hostile movement on their part, and nothing but the dread of greater disasters than those which would naturally follow their departure induced him to permit Moses to lead them away. Nor are monumental indications wanting for establishing the historical character of Moses. His interview with Merneptah is supposed to have taken place at Tanis, the temporary residence of the last three Pharaohs. He and his people marched first to Takusa, a city south of Tanis, and thence to Shekh Musa, in the neighborhood of Pithom. The route touched the most important Hebrew towns and enabled their inhabitants to join the emigrants. Moses marched them in an easterly direction through the wady Tumilat, which Hebrew labor had supplied with a canal. The Hebrew population was especially dense in this fertile oasis. The Hebrews rendezvoused at Rameses, a central point in Goshen. A journey northeastward of about 150 m. would have taken them to the borders of Canaan, but would have brought them into conflict with the warlike Philistines. Moses led them in almost the contrary direction; "For God said, Lest peradventure the people repent when they see war, and they return to Egypt." The general

route of the exodus is now fairly established. The Hebrews marched S. E. for three days, then turned S. W., and finally E., their fourth encampment being at Pi-hahiroth, a few miles S. of the present Suez, near a point where the gulf of Suez suddenly narrows to a quarter of its former width. They were on a narrow triangular plain bounded N. by a range of cliffs and S. E. by the expansion of the sea. The Egyptian king had meanwhile gathered a considerable force, especially of chariots, the cavalry of the time, and was following hard upon the fugitives, who, hemmed in between the cliffs and the water, had no apparent way of escape. At the point here assumed as that of the passage there is still a shallow, stretching from shore to shore, almost fordable at low tide. "The Lord caused the sea to go by a strong east wind all that night, and made the sea dry land, and the waters were divided." That is, the east (or more strictly easterly) wind piled up the waters toward the head of the gulf, leaving the shallow dry. The idea which painters have popularized, that the waters stood up as a solid wall on each side, is wholly without warrant in the sacred text; all that is implied is that there was deep water on each side of the passage. The crossing was apparently made during the day. At nightfall the Egyptians came up, and seeing the passage still dry attempted to follow. It is apparently implied in the text, though not directly stated, that the wind now shifted; for an easterly wind would have carried the bodies of the Egyptians to the west side, whereas the Hebrews beheld them thrown on the eastern shore, upon which they were. All the implications of the narrative are that the reflux of the waters was gradual; for we are told that "the Lord took off [or rather clogged up] their chariot wheels, and made them go heavily;" that is, probably, the returning waters slowly filtered into the sand, making it difficult for the chariots to move. The Egyptians, seeing the waters rising, endeavored to retreat; but in the darkness, their returning van encountering their advancing rear, they could go neither way, and were swallowed up by the rising tide. That this passage was really miraculous is everywhere asserted or implied by all the sacred writers who speak of it. Their route at first lay parallel with the eastern shore of the gulf of Suez, which they apparently touched at one point, the halting places being specified, and several of them are identified with reasonable certainty. At one of these, Rephidim, they were attacked by a body of Amalekites, who were defeated by the Israelites under the command of Joshua. After three months they reached the region of Sinai, in the heart of the Arabian peninsula, where they remained until 14 months after their departure from Egypt, and then set off upon their long wanderings toward the promised land. During this interval the law was given, and those religious and civil institutions were

framed which in the course of a generation transformed the Hebrews into a military people, able to cope with the enemies whom they were about to encounter. The history, as related in the book of Exodus, properly closes with the encampment around Sinai, and is continued in the book of Numbers. (See SINAI.) —The best works on the historical narrative are Ebers's *Ägypten und die Bücher Mose's* (Leipzig, 1868 *et seq.*) and *Durch Gosen zum Sinai* (Leipzig, 1872), and Palmer's "The Desert of the Exodus" (London, 1872).

EXOGENS (Gr. *ἐξω*, outward, and *γεννᾶν*, to generate), a class of plants so called because their woody matter is increased by additions to the outside of that which first surrounds the central pith. As there are no specific limits to the age of exogenous trees, their diameter indefinitely increases by this annual process, a distinct external layer being added by each year's growth. The stem of an exogen consists of a central column of pith or medulla, woody zones, and bark. Processes from the central medulla called medullary rays cross the zones transversely. The bark of an exogen parts readily from the underlying wood at a particular season of the year, when a viscid secretion called *cambium* is produced between the wood and the inner surface of the bark. It is at this period that the leaves expand and the trunk lengthens. The woody fibres in the leaves are prolonged into the stem or trunk, passing down among the cambium, and adhering partly to the wood and partly to the bark of the previous year. By this means new living matter is continually deposited upon the outer portion of the woody stem and the inner portions of the bark. It is in this part of the stem that the intensest vitality exists, the outer and older layers of the bark and the inner and older concentric rings of the wood becoming inert and falling off or decaying without injury to the vegetative parts. The office of the medullary processes is very important as means of communication between the centre of the stem and the outside layers or rings; and they are conduits, so to speak, by which the fluid matter passing down the bark can reach the wood next the medulla or pith. These processes, which resemble thin plates, are of a spongy nature similar to that of the pith from which they originated. They sometimes assume sinuosities and undergo partial obliteration; and sometimes the wood itself assumes an excessive irregularity. As these circumstances are to be found mostly in tropical exogenous trees, vines, and climbers, difficulty is sometimes experienced in perceiving from transverse sections their claims to be considered as exogens. This natural character of an outward growth in the exogens is associated with other peculiarities of development of other organs. Thus, the leaves have veins ramifying from the midrib outwardly to the circumference; or if there are several ribs, the veins are still of the same quality, so as to

form an irregular network. These veins never run parallel to each other without ramifications, and even some which appear to do so will be found to possess secondary veins. The leaves also fall away from the branches, being disarticulated from their places of insertion, leaving a clear scar behind. Certain foliolate organs, called stipules, are also frequently attached to the leaves, which is very unusual in endogens. The flowers are mostly quinary, that is, they have five sepals, five petals, and five stamens, or some multiple of that number. The tall and feathery outline of the palms is never seen in the exogens, as none of them depend on a single terminal bud for their developing growth. From the very germination of the seed the difference is apparent in the form of the embryo and in the dicotyledonous characteristics of the young plant.

EXORCISM (Gr. *ἐξορκισμός*, adjuration), a rite having for its object to cast out evil spirits, or to withdraw irrational things from their influence. As the natural attendants of a belief in demoniacal possession, exorcisms have been practised in every age and country. The pagans of old, like those of to-day, were firm believers in the malignant influence of spirits, genii, or demons. Mysterious diseases and other incomprehensible calamities were attributed to such influences. The "medicine dances" in use among the American Indians are found to spring from the same belief which gave rise to the fumigations of the Greeks, Romans, Arabs, and Persians. Among the Greeks exorcising was a profession. *Æschines* and *Epicurus* were the sons of women who lived by exorcism, and when young practised the art with their mothers. Besides incantations, the burning of certain herbs and drugs, the use of magic ointments, the wearing of amulets, &c., human sacrifices were exceptionally also resorted to; and they are still in use among the tribes of south Africa. The Semitic nations, who kept alive the belief in the one God, form no exception. Among the Hebrews we read of David playing on a harp to procure the departure of the evil spirit which troubled Saul, and that Tobit, by command of an angel, burned the liver of a fish to expel the evil spirit which followed his betrothed wife; and *Solomon*, according to *Josephus*, was a mighty exorcist, and left several formulas to be employed in the rite. Christ, who drove out devils himself, bears testimony to the fact that the Jews did so in his day. This power he also committed to his 70 disciples when he sent them on their first mission, and promised that it should be exercised in the church after him. All early Christian writers bear testimony to the fact that exorcisms were practised universally in the churches. This was done more particularly for catechumens, who were adults converted from paganism, and defiled by the unclean initiations and practices of demon worship. The great number of those considered really possessed in these ages, and

the frequent exorcisms performed on catechumens during their long probation, caused the creation of the order of exorcists, which still exists both in the Greek and Roman Catholic churches. In both also the rituals prescribe exorcisms not only for adult, but even for infant baptism, on the ground that by the fall the entire human race has come under the power of Satan. And as the power of the evil one extends to the whole inferior creation, both churches exorcise water, salt, oil, &c., before blessing them and using them as symbols and instruments of Christ's redeeming grace. As the earth was cursed after the fall, so now the church extends Christ's blessing to it and all it contains. Hence the prayers and exorcisms prescribed in the ritual for allaying storms, checking the ravages of hurtful insects, and putting an end to droughts. From the same principle proceeds the custom of blessing habitations, fields, cattle, food, &c. Extraordinary exorcisms, in the present discipline of the Roman Catholic Church, are such as are used in cases of attested demoniacal possession. These are only performed with the permission of the bishop, in rare instances, and with unusual solemnity. The only forms of exorcism recognized by that church are those contained in the Roman ritual and missal.—Luther, in his *Taufbüchlein*, preserved partly the form of renunciation of the devil; he considered it as useful to remind the people of the power of sin. These views were adopted in the Lutheran parts of Germany. In the Swedish church, when the Augsburg Confession was again proclaimed at the council of Upsal in 1593, exorcism was retained as a free ceremony in baptism, and on account of its utility. Calvin and Zwingli rejected it, and it became a sort of test between Calvinists and Lutherans. It had become gradually obsolete among the German Lutherans when an attempt was made in 1822 to revive its use. In the first liturgy of Edward VI. a form of exorcism at baptism was retained, which was omitted in the subsequent revision of the prayer book. Canon 72 of the church of England reserves to the bishop the power of granting a license to exorcise. The only remnant of the old baptismal exorcisms to be found in the rituals of the church of England, and the Protestant Episcopal and Methodist Episcopal churches, is the question: "Dost thou renounce the devil and all his works?"—See Bingham, *Origines Ecclesiasticæ*; Stolle, *De Origine Exorcismi in Baptismo*; Ferraris, *Prompta Bibliotheca*; and *Theaurus Exorcismorum et Conjuratumum* (Cologne, 1608).

EXOSMOSE. See **ENDOSMOSE**.

EXOSTOSIS (Gr. *ἐξ*, out of, and *ὀστέον*, bone), an osseous tumor developed on the surface of a bone, originally or eventually continuous with its substance, circumscribed, without interior cavity, having the same structure and life as the bone on which it is found. There are two varieties of this growth: in one the bone, like

all other tissues of the system, takes on a morbid development, an eccentric hypertrophy of its substance, forming a well defined tumor on its surface by the mere excess of interstitial osseous deposit; in the other the new ossific matter is deposited originally on the surface, under or between the laminae of the periosteum, separated from the bone at first by cartilage, but afterward becoming consolidated to it in the usual manner of bony processes. The first variety may affect the greater part of a bone, and deserves rather the name of *hyperostosis*; and the second, by the process of ossification, may be converted into the first; this distinction is of considerable importance in the prognosis and treatment of the affection. The muscles and soft parts over an exostosis are generally not changed, unless the tumor be of considerable size and in the neighborhood of large nerves and vessels; but the periosteum is almost always thickened, and less adherent to the bone than usual. In the first variety the form is regular, and the bony fibres diverge from the natural direction to enter the tumor, as in other forms of eccentric hypertrophy; in the second variety the form is irregular, often fantastic and rough, and there is an evident base by which it is as if it were immovably articulated to the supporting bone, except in very old growths; this base in recent cases is cartilaginous and readily separated, and shows that this kind of exostosis originates from and is nourished by the investing periosteum; it indicates also a method of treatment which has been found successful, by denuding them of their periosteum and causing their necrosis and separation from want of nutrition. If the cartilaginous base rests upon the bone, under the periosteum, the removal of this membrane will cause an exfoliation of the subjacent bone; but if between the laminae of this envelope, a similar operation will effect the fall of the tumor without injury to the surface of the bone; the cartilage soon becomes ossified, and the exostosis forms one body with the bone, resembling the first variety in having no basal line of separation. In course of time the excessive deposit of phosphate of lime in these growths may convert them into a substance having the appearance, consistence, weight, and polish of ivory.—Among the constitutional causes of exostosis are syphilitic poisoning, the scrofulous diathesis, and the gouty and rheumatic conditions; the immediate cause is inflammation, produced by mechanical or other means, leading to a deposit first of plastic and then of osseous matter, the development being similar to that of normal bone. In some constitutions there is such a disposition to the deposit of ossific matter, that the slightest contusion is sufficient to cause the development of these bony growths, not only on bones but in the substance of tendons and ligaments; and the affection is often hereditary. When the growth takes place in the cavity of a bone, as in the cranial cavity, it has been called en-

ostosis, but with doubtful propriety, because in this case the growth is upon the bone and outside of its structure. The prognosis varies, principally in proportion to the rapidity of the growth, which when very slow may not be much regarded, except when interfering with the functions of some important organ, as a joint, or into the cranial cavity. The treatment also varies with the prognosis. Often the removal is not a matter of moment, as exostoses may be carried through life without much inconvenience; and the removal may be a hazardous undertaking, as when the tumor encroaches upon a joint whose cavity would become opened by the operation. If the circulation in an important artery is impeded, removal becomes desirable, and should be undertaken when there is reasonable hope of a successful result. Topical applications are often beneficial, and in the earlier stages, in the form of blisters and strong counter-irritants, often effect the removal by absorption. A strong tincture of iodine, or a solution of iodine in iodide of potassium, is often very serviceable. The constitutional treatment, particularly when syphilis has preceded the affection, should not be neglected. Preparations of mercury may be cautiously administered, particularly the iodide, and iodine may be given in combination with potash or soda salts. When much pain is experienced, anodynes may be administered, either by the mouth or topically.

EXPANSION, the property displayed by matter of enlarging in bulk by diminution of pressure, increase of heat, or in a few instances by increase of cold, and also of moisture. It is seen in solids in the common operation of setting the tire of a wheel; the iron ring, being heated in the circle of burning chips and coals, enlarges in bulk so as easily to slip over the felly, which it compresses tightly as it grows cool on the application of cold water. It is seen in liquids in the rise of mercury in the thermometer; and in æiform bodies in the ascending currents of heated air, or more plainly in the bursting of a tight bladder as the air it encloses swells by exposure to heat. The amount of expansion exhibited by different bodies by any given increase of heat is very various. Those only which exist in the æiform state, or as vapors, can be classed together in this respect. They all expand very nearly if not exactly alike by the same increase of temperature. Like air they increase in bulk from the freezing to the boiling point, so that, according to Gay-Lussac, 100 measures at the lower degree fill 137½ at the higher. For each degree of Fahrenheit the expansion of air, according to the accurate determinations of Regnault, is, under a constant volume, $\frac{1}{273}$ of its volume; for the less condensable gases it is perceptibly larger. Each solid body has its own rate of expansion, which however is not uniform for equal increments of temperature, but increases at high degrees in a faster ratio. This, unless special allowance is made for it in the graduation, in-

roduces error in thermometers, those marked off in equal divisions for the high degrees evidently not being correct. Another source of error in these instruments is the unequal expansion of the different materials. The mercury from the freezing to the boiling point of water expands, according to Regnault, in volume 1 part in 55.08; between the latter and 392°, 1 in 54.61; and between this and 572°, 1 in 54.01. Glass expands in the same range of temperature, in the first division, $\frac{1}{55.1}$; in the second, $\frac{1}{54.1}$; and in the third, $\frac{1}{54.1}$. In a mercurial thermometer it is the difference of expansion between the mercury and the glass that is indicated, and the temperature indicated by 586° would correspond to 667° determined by the expansion of glass alone, or to 572° by the air thermometer. Various instruments called pyrometers have been devised to determine high degrees of temperature by the amount of expansion of bars of different metals. They are all approximate only in their results, unless the rate of expansion of the metal bars has been accurately investigated by the help of the air thermometer; and the labor attending such a study has rarely been bestowed upon these instruments, which in every form are now generally superseded by the air thermometer itself or by the electric pyrometer of Siemens. (See PYROMETER, and THERMOMETER.) The expansions of various solids from 32° to 212° are presented in the following table:

NAMES.	Expansion in length.	Expansion in bulk.	Authorities.
Zinc, cast.....	1 in 886	1 in 112	Daniell.
" sheet.....	1 " 840	1 " 118	Smeaton.
Lead.....	1 " 851	1 " 117	
Tin.....	1 " 516	1 " 172	
Silver.....	1 " 594	1 " 176	Lavoisier and Laplace.
Brass.....	1 " 536	1 " 179	
Copper.....	1 " 583	1 " 194	
Gold.....	1 " 683	1 " 227	
Bismuth.....	1 " 712	1 " 239	Smeaton.
Iron.....	1 " 846	1 " 282	Dulong and Petit.
Antimony.....	1 " 928	1 " 307	Smeaton.
Untempered steel.....	1 " 936	1 " 309	Lavoisier and Laplace.
Palladium.....	1 " 1,000	1 " 338	Wollaston.
Platinum.....	1 " 1,131	1 " 377	
Glass without lead.....	1 " 1,148	1 " 392	Dulong and Petit.
Flint glass.....	1 " 1,248	1 " 416	

The expansion in bulk is found by measurement to be about three times the linear expansion, as it should be on geometrical principles of the relations between the side and the volume of a cube. When metals become liquid by fusion, a change takes place in their density; their specific gravity increases in the cases of iron, bismuth, and antimony, as is shown by solid pieces floating upon the surface of a melted mass of the same metal. Thus it is that in castings the mould is entirely filled in its minutest parts. On the other hand, phosphorus, mercury, gold, silver, copper, and many other substances contract as they become solid; and this is the reason why coins of the last

three metals cannot be cast, but require to be stamped.—A great difference is shown in the amount of expansion of different liquids; thus water gains $\frac{1}{4}$ in bulk when its temperature is raised from 32° to 312°, oil of turpentine $\frac{1}{14}$, and mercury in a glass tube $\frac{1}{4}$. A remarkable exception to the general law of expansion of liquids in proportion as they are heated is shown in the case of pure water. When this is cooled from the temperature of 60° it continues to contract until it reaches 39.2°. From this point it expands until it freezes at 32°, its rate of expansion being about the same from 39° whether it is heated or cooled; but if kept perfectly quiescent, Despretz found that below 32° water retains its liquidity and continues to expand. He gives the following determinations:

Temperature, Centigrade.	Density.	Temperature, Centigrade.	Density.
-9°	0.999,871	+3°	0.999,999
6	0.999,083	4	1.000,000
8	0.999,577	5	0.999,999
0	0.999,878	6	0.999,999

An important beneficial effect of this peculiarity in the expansion of water is seen in the protection it affords to the natural bodies of this fluid, as lakes and ponds, against being frozen throughout. For, as the surface of the water is cooled below 39° by the cold air above, this portion by its expansion becomes specifically lighter than the water below, and consequently remains at the top. At 32° a covering of ice forms over the water, which being a poor conductor of heat preserves the great body of water from falling to a lower temperature than 39°, the point of its greatest density. The passage from the liquid to the solid state on the abstraction of heat is determined to a very considerable extent by the superficial tension of the liquid; thus Despretz finds that in fine capillary tubes water may be cooled to -20° C. (-4° F.) without solidification.—So great a power is exerted by the contraction of metals on cooling after being expanded by heating, that this has been applied as a mechanical force, as in the bringing together of heavy walls of buildings which had separated by unequal settling. Strong iron bars are passed horizontally through the opposite walls, and being heated throughout their length are closely keyed up and then allowed to cool; and the process is repeated until the desired effect is obtained. This suggests the danger of inserting bars of metal closely in walls of masonry, as the force exerted by their expansion tends to thrust portions of the wall out of place. The expansion of water has been practically applied to the rending of rocks, the fluid being poured into the fissures and allowed to freeze. This is one of the most efficient agents employed by nature for the disintegration of rocky cliffs. The expansion by access of moisture is exhibited in the swelling of the fibre of wood or of

ropes. This, too, is sometimes employed as a powerful mechanical force, as by inserting wedges of wood into cracks, or into holes drilled for the purpose in rocks, and then covering the wood with water. As this is absorbed, the wood slowly expands, exerting a steady pressure of surprising force. The presence of moisture in the atmosphere is ascertained by instruments based on this principle. (See *HYGROMETER*.) For the effect of expansion of steam, see *STEAM*.

EXPLOSIVES. An explosion may be occasioned by the sudden removal of resistance to an expanding force, as in the case of steam boilers; but it is more frequently the result of a sudden generation of energy by chemical reactions. Most explosions of this kind are instances of rapid combustion; and an explosive compound, as distinguished from a merely inflammable one, may be defined as one which contains within itself the elements of combustion or other chemical change, liberating mechanical energy. Thus the fire damp of coal mines, when pure, is inflammable; but mixed with a certain proportion of atmospheric oxygen, it becomes explosive. The ingredients of an explosive compound remain inert unless the condition of chemical reaction is supplied. This is usually heat, produced by the direct contact of a heated body, or by pressure or percussion. In some instances, however, the introduction of a new substance, or the change of aggregate condition in one or more of the ingredients, may occasion explosion. The number of explosives known to chemists is considerable. Chiefly those which are employed in the arts will be considered in this article.—*Gunpowder.* Of these, gunpowder is the most widely employed, partly because the longest known, but mainly because it is not liable to spontaneous change, or explosion from other causes than a very high temperature (that of a spark or flame, for example), and because the manufacture can be cheaply carried on to any required extent, and can be so varied as to control the qualities of the product according to the proposed use. Gunpowder presents to the eye a mass of grains, usually angular and of uniform size, dark color, and polished surface. The different varieties range from 0.5 to 4.5 mm. in diameter of grain. Its specific gravity is 1.8 to 2.0. It explodes when rapidly heated above 300° C. It is composed of charcoal, sulphur, and nitre, the two former being the combustible ingredients, and the latter, by the surrender of its oxygen, supporting their combustion. According to the theory formerly held, the nitre is reduced during the combustion of rifle powder to nitrogen and potassium, the latter forming with sulphur potassium sulphide, while all the oxygen combines with the carbon of the charcoal to form carbon dioxide (carbonic acid). The formula expressing this reaction would be $2\text{KNO}_3 + \text{S} + 3\text{C} = 3\text{CO} + \text{K}_2\text{S} + 2\text{N}$; and the proportions of ingredients in 100 parts would be: nitre, 74.84; sulphur, 11.84; char-

coal, 13.82. From blasting powder, on the other hand, carbonic oxide as well as carbonic acid is formed, and the theoretical reaction is shown in the equation $\text{KNO}_3 + \text{S} + 2\text{C} = \text{KS} + \text{N} + \text{CO}_2 + \text{CO}$, requiring the proportions: nitre, 64.4; sulphur, 20.4; carbon, 15.2. How nearly these formulas are adhered to will appear from the following tables of analyses:

I. MILITARY POWDER.

VARIETIES.	Char-coal.	Sulphur.	Nitre.	Authority.
Theoretical proportions	13.83	11.84	74.84	
Austrian	13.1	11.8	75.6	Linck.
"	15.0	10.0	75.0	Lottner.
" ordnance	13.43	12.80	73.78	Károlyi.
" small arms	14.23	8.63	77.15	
English	13.7	10.1	76.2	Ure.
French	15.0	10.0	75.0	Otto.
Prussian	12.5	12.5	75.0	Combes.
"	12.5	12.5	75.0	Magnus.
"	13.5	11.5	75.0	Gottlieb.
Russian	17.7	11.7	70.6	Meyer.
United States	14 (or 15)	10.0	76 (or 75)	Ordnance Manual.

II. RIFLE OR SPORTING POWDER.

American	14.4	9.9	75.7	
English	12.5	7.8	79.7	Otto.
"	17.0	8.0	75.0	"
"	14.0	8.0	78.0	"
French	12.0	10.0	78.0	Combes.
"	13.5	9.6	76.9	Otto.
" "B"	15.5	10.5	74.0	Revue de l'Artillerie.
German	11.27	9.84	78.99	Bunsen.
Italian	18.2	8.6	73.2	Prechtl.
Russian	12.0	8.0	80.0	Rzha.

III. BLASTING POWDER.

Theoretical proportions	15.2	20.4	64.4	
Austrian	21.36	18.45	60.19	Rzha.
French "round"	18.00	20.00	62.00	"
French "ordinary"	15.00	20.00	65.00	Combes.
Freiberg "double"	13.00	13.40	73.60	Rzha.
Hartz, coarse, strong	20.48	28.44	58.12	Lottner.
" medium	21.87	16.66	61.94	"
" weak, fine.	19.48	16.24	64.32	"
Italian	12.00	18.00	70.00	"
Mansfeld.	20.95	11.75	67.20	Dingier.
Russian	16.70	16.60	66.70	Rzha.
Westphalian	15.53	15.53	68.84	"

These variations are due partly to the variable quality of the ingredients, particularly the charcoal, which always contains water and ash. The best coal (from light non-resinous wood, like poplar, black alder, or willow) rarely contains over 83 per cent. of carbon. The composition of powder has been also varied from the theoretical formulas to obtain a variety in its effects, and the researches of Bunsen, Shishkoff, Károlyi, Craig, and Fedorow have shown that the simple reactions upon which the formulas were based do not take place; that the products of combustion, which vary somewhat with the pressure under which ignition takes place, comprise, among the gases, small quantities of carbonic oxide, hydrogen, sulphuretted hydrogen, and free oxygen, and, in the smoke and residue, chiefly the sulphate and carbonate, not the sulphide, of potassium. Bunsen found the gases from rifle powder to be but 81.4 per cent. of the weight. The pressure generated by the com-

bustion of gunpowder has been variously estimated. Gätzschmann gives the following table, compiled from different authorities:

Authority.	Estimate in atmospheres.
Robin.....	1,000
Hutton.....	1,700 to 2,500
Myer.....	3,500 to 4,000
Briançon.....	4,000
Prechtl.....	4,400
Karmarsch and Heeren.....	5,000
Gurit.....	8,980 to 8,640
Plobert.....	7,500
Bernoulli.....	10,000
Rumford.....	22,178 to 54,740

The usual estimate at present is for rifle powder 4,000, and for blasting powder 2,000 atmospheres. It is believed that in practice half these figures are realized. The latest researches upon the heat set free by the combustion of powder, those of Roux and Sarrau (*Comptes Rendus*, July, 1878), give the following results:

VARIETIES.	COMPOSITION.			Calories per kilo-gramme.	Weight of gases per kilo-gramme.
	Nitre.	Sulphur.	Charcoal.		
Fine sporting.....	78	10	12	807.8	0.897
Cannon.....	75	12.5	12.5	752.9	0.412
B musket.....	74	10.5	15.5	730.8	0.414
Export.....	72	18	15	694.2	0.446
Blasting.....	62	20	18	570.2	0.499

The time within which this pressure is developed is an important element in the practical effect. The particles of the powder are successively ignited and combustion becomes general. The rate of ignition is more rapid, and that of combustion is slower, the larger the grain of the powder. The finest-grained powder, when pressed closely together, behaves like a single mass, burning with comparative slowness, and hence showing less explosive power. It is employed in rockets and fireworks. For rifled guns, a coarse grain is now preferred, since its quick ignition gives the force required to press the projectile into the grooves, while its prolonged combustion augments the pressure until the projectile leaves the gun with maximum velocity. Blasting powder, which is required to lift and split, rather than to throw, is usually coarse-grained, though modern practice is tending to the employment of "quicker" powders; a change due to the observed effectiveness of the nitro-glycerine compounds. The composition of ordinary blasting powder, as above shown, effects a slow combustion.—A blasting powder now used to a considerable extent in this country contains Chili saltpetre (nitrate of soda) instead of nitre. It is unsuitable for sporting or military purposes. Another variation from the usual formula is Oliver's powder, made in Pennsylvania, in which peat is substituted for charcoal, with increased safety of manufacture and cheapness of product. The West Virginia mineral grahamite, a hydrocarbon, has also been experimented upon as a substitute for

charcoal, with favorable results. Common powder soaked at the moment of using in nitro-glycerine has been used in Swedish quarries, with trebled effectiveness. Dynamite is safer and better. Pyronene is a cheap, inferior blasting powder, made of 52.5 parts nitrate of soda, 20 parts sulphur, and 27.5 parts spent tan. In Davey's powder a part of the charcoal is replaced by flour, starch, &c., for safety in preparation. Slow-burning powders used in Germany (Neumeyer's, Kùp's, &c.) contain less sulphur and more coal than the ordinary kind. They are recommended for safety and small amount of smoke.—An intimate mixture of 8 parts nitre, 2 parts dry carbonate of potassa, and 1 part sulphur will when slowly heated (*e.g.*, in an iron spoon) first melt, and soon after explode with deafening noise. The sulphur acts upon the carbonate of potassa, producing "liver of sulphur," a mixture of the sulphide with the sulphate of potassa; this is suddenly oxidized by the decomposition of the nitric acid, and nitrogen gas is liberated. The experiment should be tried with a small quantity only, say as much as will cover the tip of a knife blade. (See GUNPOWDER.)—*Pyroxyline*. In the explosives classed above under gunpowder, the sulphur plays the part of a stimulant of chemical action, by its superior readiness to ignite. It is the nitric acid and the carbon which, forming voluminous gases, generate the explosive force; and these substances can be brought together in such ways as to form explosive compounds which have the advantage of leaving no solid residues or smoke. Pyroxyline is the name given to the class of detonating substances produced by the action of concentrated nitric acid upon the cellulose of cotton, hemp, paper, sawdust, &c. Gun cotton was discovered in 1846 by Schönbein, and also by Böttger. The conversion of cotton into gun cotton by the action of nitric acid scarcely changes its outward appearance. Chemically, it contains much hyponitric acid. It will ignite at 50° to 150° C., and leaves no residue after explosion. Its effectiveness is variously estimated at from two to six (probably four) times that of gunpowder. According to the best modern formula, gun cotton is trinitro-cellulose, $C_6H_7(NO_3)_3O_2$. The products of combination are entirely gaseous. Károlyi gives the following, in 100 parts:

CONSTITUENTS.	By volume.	By weight.
Carbonic oxide.....	28.55	28.92
Carbonic acid.....	19.11	30.43
Marsh gas.....	11.17	6.47
Binoxide of nitrogen.....	8.88	9.59
Nitrogen.....	8.56	8.71
Carbon.....	1.85	1.60
Aqueous vapor.....	21.98	14.28
	100.00	100.00

When burned under pressure, the nitric oxide reacts more completely with the carburetted hydrogen, and the result of this and other

causes is a greater volume of evolved gases. The actual product of heat units as compared with the combustion of gunpowder is proportional, according to Dr. Craig, to the respective amounts of oxygen concerned in the two cases; but the greater volume of the gases from gun cotton renders their temperature lower and their mechanical effect greater. This material burns without explosion when ignited in the open air. Ordinary percussion sometimes ignites it—a source of peril in packing bore holes. The acid and aqueous gases which it evolves have prevented its use in ordnance; moreover, it is very hygroscopic and liable to spontaneous decomposition, sometimes leading to explosion, rendering its storage perilous. Many of these objections, together with that of bulk, have been removed by Abel's process of manufacturing gun cotton in compressed solid cylinders, which burn harmlessly, can be stored and transported with safety, and explode with great power when ignited under confinement by means of a detonating powder. The experiments of Gen. Lenk, in Austria, led to this improvement. The compressed gun-cotton is adopted in that country for artillery. Gun cotton is used as a filter for strong acids, and also (dissolved in ether) as a varnish. (See COLLODION, and GUN COTTON.)—Xyloidine is the white, pulverulent, and very explosive substance obtained by Braconnet in 1833, by treating starch with concentrated nitric acid. Lithofracteur is the name originally given to a white blasting powder, consisting of coarsely ground saltpetre and sulphur, with a third substance, supposed to be sawdust or bran, treated with nitric acid. The improved lithofracteur described below is a different substance.—Schultze's chemical powder, sometimes called wood gunpowder (introduced in 1864), contains no sulphur; and the charcoal is replaced with wood which has been triturated, deprived of its acids, soluble salts, proteine, and albumen, and treated with concentrated sulphuric and nitric acid. These grains of wood are subsequently saturated with nitrate of potash or baryta, or both, and dried. The powder can be wet and dried again without weakening it; hence it may be kept or transported in a damp state with perfect safety. It is about one third as dense as gunpowder, is more powerful, and leaves but a trifling residue. But it seems to have been superseded by nitro-glycerine compounds. Some inexplicable explosions have occurred with it. The gases produced from it in mining have been complained of, possibly without good reason.—Haloxylene is a powder tried in Austria, which contains no sulphur, and in which the charcoal is apparently represented by woody fibre. Like the slow-burning Neumeyer powder, it gives comparatively little noxious gas, is hygroscopic, and works better in solid than in fissured rocks. It is asserted to burn harmlessly in the air; but like many other "harmless" powders, it has given rise to some strange and

disastrous explosions. The above account of its composition follows the *Oesterreichische Zeitschrift* (1866 and 1867); Wagner's "Technology" (1870) says it contains charcoal, nitre, and yellow prussiate of potassa.—*Nitro-glycerine*. This substance, known also as fulminating oil, nitro-leum, trinitrine, glyceryl nitrate, and glonoine, and undoubtedly the most important explosive since gunpowder, was discovered in 1847 by Sombroero, then a student with Pelouze in Paris. It is formed by treating glycerine with concentrated sulphuric and nitric acid. (See GLYCERINE.) Until 1864 it found no practical application, except as a homœopathic remedy for headaches similar to those which it causes. In that year Alfred Nobel, a Swede of Hamburg, began its manufacture on a large scale, and, though he sacrificed a brother to the terrible agent he had created, has persevered until in its later and safer forms nitro-glycerine has come into wide use and popularity. It is a clear, oily, colorless, odorless, and slightly sweet liquid, heavier than water and insoluble in it, but soluble in ether and methyl alcohol; crystallizes in long needles at 4° to 11° C. At -15° C. it becomes after a while thick; prolonged exposure to -2° C. solidifies it. It detonates in the open air, under a strong blow or shock; ignites with difficulty when poured out in a thin sheet, and even then burns incompletely without explosion. It can be evaporated at 100° C., if boiling is avoided; but boiling, or the temperature of 180° C., causes an explosion. Confined or frozen, so as to permit the instantaneous transmission of an impulse through the mass, it will explode, sometimes under a very slight shock. It is usually exploded with a detonating fuse. When badly prepared or preserved, it is liable to decomposition, yielding gases which exert a pressure within the containing vessel and create a condition of perilous sensitiveness to external shocks. The modern formula is $C_3H_5N_3O_9$, or $C_3H_5 \left\{ \begin{array}{l} NO_2 \\ NO_3 \end{array} \right\} O_2$; hence it is glycerine, $C_3H_5 \left\{ \begin{array}{l} H \\ H \end{array} \right\} O_2$, in which 8 atoms of H have been replaced by 8 atoms of NO_2 . Its specific gravity is 1.6; and 100 parts yield on combustion:

CONSTITUENTS.	By weight.	By volume.
Aqueous vapor.....	20	55,400
Carbonic acid.....	58	46,900
Oxygen.....	8.5	8,900
Nitrogen.....	18.5	28,600
	100.0	139,800

According to L'Hôte, the oxygen is united with part of the nitrogen as protoxide. The heat liberated by the combustion is estimated to be twice as much as that of gunpowder; hence, while one volume of the latter yields in practice 200 volumes of cold gases, expanded by heat to 800 volumes, an equal weight of nitro-glycerine yields 1,298 volumes of gas, expanded to 10,384 volumes, giving 18 times the force of gunpowder. But the explosion takes

place much more suddenly than that of gunpowder; hence the practical gain in effect is greater than the above figures show. The suddenness with which the forced is developed renders nitro-glycerine unsuitable for ordnance. The very dangerous character of this material has led to various restrictions upon its transportation. It continues to be used in many places, and is prepared on the spot as it is required. In the Hoosac tunnel, Massachusetts, the United States works at Hallett's Point, New York, and at San Francisco, it was employed. Its insolubility in water and its liquid form and high gravity render it very convenient for submarine operations and blasting in wet ground. But its form brings a danger that portions of it, unexploded even in bore holes, may be scattered in rock fissures, or portions may be split accidentally, or may remain in vessels once filled, and afterward be exploded by accident. The proper way to get rid of it is to pour it into a running stream. To remove the great dangers connected with the preparation and transportation of this material, many propositions have been made, principally for mixing the oil with some substance (wood spirit, sulphate of zinc, lime or magnesia, &c.) which would render it explosive, and which could afterward be removed by simple means (*e. g.*, by water) when the oil was to be used. None of these have come into use. When congealed it has been thought more dangerous than when fluid; but this view is now contradicted by many practical authorities. Certainly careless handling and thawing of frozen nitro-glycerine has caused much loss of life and property. Through the pores or in the stomach, even in small quantities, this oil causes a terrible headache and colic. Headache likewise results from inhaling the gases of its combustion; but all persons are not alike affected by these; and it is probable that most persons suffer little inconvenience from this cause when they have become accustomed to it.—Nobel introduced in Swedish quarries the practice of soaking common gunpowder with nitro-glycerine before blasting. The effect produced was very great; but this method was soon superseded by the invention of dynamite or giant powder, also introduced by Nobel. Dynamite is finely pulverized siliceous, or silicious ashes, or infusorial earth (most frequently the last), saturated with about three times its weight of nitro-glycerine, and constituting a mass resembling damp Graham flour. The pulverulent form prevents the transmission of ordinary sudden shocks, except under pressure in a confined space. The pressure of the inert mineral constituents serves also to absorb heat, so that a high temperature cannot be so easily imparted to the whole; but when imparted, this temperature effects a great expansion of the gases and increased effectiveness of explosion. Ignited in the open air, dynamite burns quietly with nitrous fumes. Exploded (usually by means of a fulminating fuse or cap), it gives carbonic acid, nitrogen, and hydrogen,

and leaves a white ash, with little or no smoke. Under favorable circumstances, the effectiveness of dynamite is equal or superior to that of nitro-glycerine; a fact not surprising, if it be remembered that the latter is liable to scatter unexploded drops, by reason of the maximum rapidity of its ignition. Dynamite is now generally recognized as the safest of all explosives. It is not affected by a prolonged temperature of 100° C., nor is it as dangerous as nitro-glycerine when it solidifies (at 8° C.). Neither light nor electricity nor ordinary shocks cause it to decompose or explode. The principal dangers connected with its use are those of the strong fulminating powders used in the percussion fuses to explode it. It is also possible that if dynamite is carelessly made, it may contain an excess of nitro-glycerine, which, overcoming the capillary force of the mineral particles, may collect in drops and settle from the mass, becoming a source of serious accidents. Moreover, it may be that freezing, or thawing after freezing, has a tendency to segregate the oil.—Duelline, introduced in 1869 by Lieut. Dittmar, is another nitro-glycerine powder, consisting probably (the exact composition is a secret) of Schultze's wood gunpowder, saturated with this oil. Another formula is, in 100 parts, 50 of nitro-glycerine, 80 of fine sawdust, and 20 of nitre. It has been considerably used in Germany and the United States. As compared with dynamite (which it resembles in many respects), it has the advantage that it can be exploded under confinement with an ordinary blasting fuse; that it does not congeal so easily as dynamite; and that it is cheaper. As a disadvantage, Serlo mentions, that under some conditions it partially explodes, partially burns, and in this case produces noxious gases.—Improved lithofracteur, or lithofracteur-dynamite, manufactured by Krebs at Deutz near Cologne, is supposed to be the former lithofracteur saturated with nitro-glycerine. Another formula is, in 100 parts, 52 of nitro-glycerine, 80 of siliceous earth, 12 of stone coal, 4 of nitrate of soda, and 2 of sulphur. This would be a mixture of dynamite with a very bad gunpowder. The safety and effectiveness of dynamite are claimed for this powder, with an additional advantage that it can be exploded at much lower temperature—as low, according to some experiments, as —12° C.—Nobel has recently patented new nitro-glycerine powders, of different degrees of strength. The strongest consists of 68 parts nitrate of baryta and 12 parts rich bituminous coal, saturated with 12 parts nitro-glycerine. Nearly as powerful is a mixture of 70 parts nitrate of baryta, 10 parts resin, and 12 parts nitro-glycerine. The effect of each may be increased by adding 5 to 6 parts sulphur. They are exploded with percussion fuses.—Dr. Justus Fuchs, formerly in Nobel's employ, has proposed as an improvement on dynamite a compound containing 85 instead of 75 per cent. of nitro-glycerine, and instead of infusorial

earth a chemically prepared substance, possessing greater absorbing power, and capable of complete combustion with almost no solid residue.—The Colonia powder, manufactured in Cologne, is said to be a black gunpowder, with 80 to 85 per cent. of nitro-glycerine. It is exploded by artificial means only.—*Chlorate of Potassa Powders*. The property of acids containing large proportions of oxygen to part with it readily is strongly shown by chloric acid, HClO_3 , in which the oxygen is very loosely held. The anhydric acid cannot be isolated; but the salts (particularly of potassa and baryta) have been extensively employed in the manufacture of explosives, by mixing with combustible materials. Even the heat of percussion or friction causes them when so mixed to detonate. A few centigrammes of chlorate of potassa rubbed in a mortar with sulphur or sulphide of antimony, will explode loudly and perhaps shatter the mortar. A chlorate should never be mixed by rubbing with a combustible substance. A mixture of chlorate of potassa with sugar, sulphur, sulphide of antimony, or similar substances, may be ignited by sunlight alone, or by a drop of sulphuric acid. On this principle were based the matches (now out of fashion) which were tipped with a mixture of chlorate of potassa and sugar, and were ignited by pressing them upon asbestos, saturated with sulphuric acid. During the French revolution, it was attempted to replace nitre in gunpowder with chlorate of potassa; but the mixture was too explosive for artillery purposes. Berthollet's experiments at Essonne, in 1792, were stopped by a terrible explosion; he had a narrow escape, and several were killed. A cane, striking powder on the floor, was the cause. Percussion caps were formerly filled with gunpowder out of which the nitre had been leached, and to which this chlorate had then been added. Sir William Armstrong uses a mixture of amorphous phosphorus and chlorate of potassa as a percussion powder for discharging ordnance. A mixture of equal weights of black sulphide of antimony and chlorate of potassa is generally employed for this purpose.—White gunpowder, introduced in 1849 by Augendre, for bronze ordnance and shells, is composed of 28 parts yellow prussiate of potassa, 28 parts loaf sugar, and 49 parts chlorate of potassa. According to Wagner, the gaseous products of complete combustion should be 47.4 per cent., and the solid residue (cyanide and chloride of potassium and carburet of iron) 52.6 per cent. The gases from 100 grammes would amount, at 0°C . and 769 mm. barometric pressure, to 40,680 cubic centimetres; and at 2604.5°C ., the estimated temperature of combustion, to 431,162 cubic centimetres. The cost and corrosiveness of this powder have prevented its adoption.—Blake's "safety explosive," patented in England, consists of one part sulphur and two of chlorate of potash. These substances are kept dry and separate, and mixed when required. The powder burns slowly when ignited, but its

explosion is effected by means of a detonating tube, containing the compound itself, fulminating mercury, and ordinary powder. The last is ignited.—A blasting powder is made at Plymouth, England, consisting of tan bark soaked in chlorate of potash and covered with powdered sulphur. It is said to burn slowly in the open air, but to explode with great energy when confined.—Explosive paper is prepared by impregnating paper with a mixture of 9 parts chlorate of potassa, $4\frac{1}{2}$ of nitre, $8\frac{1}{2}$ of ferrocyanide of potassium, $8\frac{1}{2}$ of powdered charcoal, $\frac{1}{10}$ of starch, $\frac{1}{10}$ of chromate of potassa, and 80 of water which has been boiled about an hour. The paper, when dry, cannot be exploded by jar or percussion, or by a temperature less than that of its combustion. Experiments with it in Austria have given good results.—*Chloride of nitrogen* is perhaps the most terrible explosive known to chemists. Dulong, who discovered it in 1812, and lost an eye and several fingers on the occasion, kept the discovery a secret, lest other chemists should repeat his perilous experiments. The unfortunate result was that Davy, who subsequently made the same discovery, was also injured. It is sometimes unintentionally produced in the treatment of ammoniacal solutions with chlorine. In such cases the chemist, having discovered its presence, quietly retires, locks the laboratory, and leaves the dreadful intruder to spontaneous and harmless decomposition, which takes place in the course of a day or two. Hypochloric acid, in gas or liquid form, is scarcely less dangerous.—*Picrate of Potash Powders*. Picric acid, obtained by the action of nitric acid upon carbolic acid, is a compound of carbon, nitrogen, hydrogen, and oxygen, the formula, as given in Wagner's "Technology," being $\text{C}_6\text{H}_3(\text{NO}_3)_3\text{O}$. Its salts are explosive *per se*, and have been used in torpedoes. Their preparation has given rise to some frightful explosions; one at the Sorbonne, in 1869, killed five persons, and wounded many more. Dessignolle's powder for blasting is a mixture of picrate and nitrate of potassa, to which for a gunpowder charcoal is added. Sulphur is unnecessary. The advantages claimed for it are the harmless character of the products of combustion (nitrogen, aqueous vapor, and carbonate of potash), and the control of its power by variation of the percentage of the picrate. Ten grades are manufactured, containing from 8 to 20 per cent. of this substance, the lowest being equal in effectiveness to common powder.—Ammoniakrut is a new powder invented by the Swedish chemist Norrbin, and believed to resemble the foregoing, but to contain picrate of ammonia instead of potassa. It is black, doughy, and damp; is ignited with difficulty by flame; explodes under percussion; does not congeal at ordinary temperatures; has an explosive energy exceeding even that of dynamite; but is said to be liable to decomposition, to attract moisture and lose power when stored, and to

be useless if once frozen. It leaves no solid residue.—*Fulminates*. The compounds of cyanogen comprise many highly explosive substances, among which the fulminates, or salts of fulminic acid, are the most important. Fulminic acid (Lat. *fulmen*, a thunderbolt) is, according to the most modern formula (Kekulé's), a nitro-compound of the group C_2H_3N (acetonitril), and hence called nitro-acetonitril. One of the hydrogen atoms is replaced with an atom of NO_2 , giving for the acid $C_2(NO_2)H_2N$. In the salts the hydrogen is replaced with a metal; thus the fulminate of silver is $C_2(NO_2)Ag_2N$. This hypothesis explains the fact that the fulminates react very differently from the cyanates (mono-, di-, and tribasic), all of which have the same proportions of C, N, and metallic base, but doubtless different atomic arrangements. Mercury fulminate (empirical formula, $C_2N_2O_4Hg$.) is prepared by dissolving at a moderate heat, in 12 parts of nitric acid of the specific gravity of 1.35, 1 part of mercury, and adding 11 parts of 90 to 92 per cent. alcohol. Liebig recommends a glass flask, the capacity of which is 18 times the volume of the mixture. In this the mercury is dissolved in cold acid, the nitrous fumes being retained in the flask. The solution is poured into a second vessel, containing one half the alcohol; and the mixture is then returned into the first flask, where it reabsorbs the nitrous fumes. In a few moments bubbles rise from the bottom, where a heavy liquid begins to be segregated. By gentle shaking this is mixed with the supernatant liquid, and a tempestuous ebullition takes place, with evolution of white fumes, and some nitrous acid, the mass becoming black from segregated metal. The remainder of the alcohol is gradually added; the black color disappears, and the fulminate is deposited in sparkling brownish gray crystals. The vapors are chiefly carbonic acid and nitrous ether. Mercury fulminate is scarcely soluble in cold water, but dissolves in 180 parts of boiling water, which gives a means of refining it by recrystallization. It explodes at $186^\circ C.$, or under friction or percussion between hard substances. When moistened with 5 per cent. of water, only the portion actually struck explodes. In contact with a tightly packed explosive mixture, its detonation explodes the mixture more rapidly and completely than any other method of firing. Hence its universal employment in the manufacture of percussion caps and detonating fuses. According to the French method, one kilo of mercury gives $1\frac{1}{2}$ kilo of fulminate, sufficient for 40,000 caps. It is ground with 80 per cent. of water under a wooden muller on a marble bed, and 6 parts gunpowder are added for every 10 of fulminate. The mixture is dried, granulated, and sized. A drop of gum is introduced into each cap, and the fulminate powder is dropped upon it. Some caps are varnished, to make them water-proof. English fulminating powder consists of 8 parts mercury fulminate, 5 parts chlorate of potassa, 1 part

sulphur, and 1 part powdered glass. Gum is sometimes added in the mixture. Nitre is also recommended. Samuel Guthrie of Sackett's Harbor, N. Y., whose extensive and perilous experiments are described in the "American Journal of Science" for January, 1832, found that 1 part oxide of tin with 8 parts mercury fulminate, ground together with a stiff solution of starch, made a very effective compound. During these experiments Mr. Guthrie discovered chloroform, as did French and German investigators at about the same time.—Silver fulminate is more explosive and dangerous than the mercury salt. It may be made like the latter, using fine silver instead of mercury; or by introducing finely pulverized nitrate of silver into concentrated alcohol, shaking it well, and adding an equal amount of fuming nitric acid; or by treating freshly precipitated oxide of silver with ammonia. It is employed in the manufacture of explosive toys. Gold and platinum fulminates are similar compounds to the foregoing, but they are not employed in the arts.—Fulminating aniline, or chromate of diazobenzole, obtained by the action of nitrous acid upon aniline, and the precipitation of the product by the aid of a hydrochloric acid solution of bichromate of potassa, is, according to Caro and Griess, an efficient substitute for fulminating mercury.—*General Theory of Explosives*. Explosive substances are said to "possess potential energy by virtue of certain unsatisfied affinities between the elements of which they are compounded." In the act of explosion these affinities are satisfied, and the potential energy becomes kinetic, taking first the form of heat; which is partially expended in giving elastic force to the new gaseous compounds generated. Perhaps this statement does not exactly cover cases like the chloride of nitrogen, which explodes by dissociation, leaving free chlorine and nitrogen. The elastic force at any instant of an explosion and the total energy developed are two different things. The intensity of the force depends upon: 1, the amount of actual heat developed; 2, the volume which a unit of the mass of the products occupies at the instant; 3, the specific heat of these products; or, in other words, upon: 1, the volume of the products; 2, their temperature. The total energy is dependent upon: 1, the ratio between final volume of products and original volume of explosive; 2, the total actual heat of the explosion. The maximum intensity depends chiefly upon the rapidity with which the conversion of the explosive into gas takes place, and this depends on varying conditions, no explosion being absolutely instantaneous. The primary condition is the rapidity with which the chemical reaction among the constituents takes place. Some, as nitrate and chlorate of potassa, require heat for their decomposition; others are probably dissociated by the vibrations produced by percussion or the exploding spark, as nitro-glycerine and chloride

of nitrogen. Some have so little stability that sound alone is sufficient to precipitate the explosion, as iodide of nitrogen, which may be exploded by sounding a tuning fork of the proper pitch in its vicinity. When heat is required, the rapidity of decomposition will depend also upon the rate of ignition throughout the mass. Thus in a charge of granular gunpowder, the flame from the vent passes between the grains, progressively enveloping their surfaces, and through the pores of each into the mass, its progress being much hastened by the enormous tension produced when the explosion is confined. Hence the rate of ignition (and consequently the intensity of the force at a given instant) may be varied by varying the size of pores and interstices in the mass; a fruitful field of experiment and improvement, particularly in gunpowder. It is evident also that the tension is dependent upon the resistance to the expansion of the gases, and will rapidly increase unless the restraint is withdrawn in proportion to their progressive development. The increase of tension brings with it increased rapidity of ignition and decomposition, and this in turn augments the tension, which is thus a self-multiplying quantity. Restraint may be offered by an enclosing solid material, or by the inertia of the gases themselves, and the surrounding air. If a block of compressed gun cotton is ignited in the open air by a flame of moderate temperature, it will often consume away very gradually; but if ignited by an electric spark, or the impact of a bullet, it will explode with great violence; the probable explanation being that in the former case the first ignition at lower temperature permitted the gases to expand without producing a very high tension, this relation continuing to the end, while in the latter case the first ignition was violent, and the relief too slow to prevent a self-multiplying tension.

EXPONENT (Lat. *exponere*, to manifest), in arithmetic and algebra, a small figure or letter, written to the right of and above a quantity or algebraic term, to show how often the quantity or term must be taken as a factor. Thus, 8^4 (which is read "the fourth power of 8," or "8, fourth power") signifies that 8 is to be taken as a factor four times, or multiplied into itself three times, as follows: $8 \times 8 = 9$; $8 \times 9 = 27$; $8 \times 27 = 81$. In like manner $(a+b)^c$ signifies that the sum of the numbers represented by a and b must be multiplied consecutively into itself as many times less one as there are units in c . (See **ALGEBRA**).—Exponential equations and functions are those in which the exponents contain unknown or variable quantities; such as $y = a^x$, in which x is the only known quantity. Exponential equations are usually reduced to logarithmic, and thus solved.

EXPRESS, a messenger or conveyance sent on any special errand, particularly a courier despatched with important communications. In the United States the word is applied to a

system organized for the transportation of merchandise or parcels of any kind. This system was originated March 4, 1839, when, agreeably to announcement published for several days in the newspapers, Mr. William F. Harnden of Boston made a trip from that city to New York as a public messenger. His route was by the Boston and Providence railroad and the Long Island sound steamboat, which connected with that line. He had in charge a few booksellers' bundles and orders, and some brokers' parcels of New York and southern and western bank notes to deliver or exchange—a service for which he charged an adequate compensation. Mr. Harnden proposed also to take the charge of freight, and attend to its early delivery, for which purpose he had made a contract with the above named railroad and steamboat companies, and was to make four trips per week. The project recommended itself to business men, especially those whose communications between the two cities were frequent. It was particularly acceptable to the press, to which Mr. Harnden made himself very useful in the voluntary transmission of the latest intelligence, in advance of the mail. A year later (1840) a competing express was started by P. B. Burke and Alvin Adams, the ownership and sole operation of which soon devolved upon the latter. In 1841 Mr. Adams associated with himself William B. Dinsmore of Boston as his partner, and gave him the charge of their New York office. Adams and co.'s express was carried by the Norwich and Worcester route. In 1840 D. Brigham, jr., Harnden's New York agent, became his partner, and soon after went to England, where he laid the foundation of Harnden and co.'s foreign business. He returned in 1841, and in that year their line was extended as far south as Philadelphia, and west to Albany. A year or two later Adams and co. established E. S. Sanford as their agent in Philadelphia, and he became a partner in their business there. He also became associated with S. M. Shoemaker of Baltimore in an express from Philadelphia to Washington, D. C. About the same time Harnden and co.'s Boston, Springfield, and Albany express was purchased by Thompson and co., who gave it their name, which it still bears. About the same period Gay and co., afterward Gay and Kinsley, commenced what is now known as Kinsley and co.'s express, running between New York and Boston, *via* Newport and Fall River. The express lines from Albany to Buffalo, and thence to the remoter west, were established by Henry Wells. The first express west of Buffalo was commenced in April, 1845, by Messrs. Wells, Fargo, and Dunning, under the style of Wells and co. It was disposed of two years afterward to William G. Fargo and William A. Livingston, who continued it, under the style of Livingston and Fargo, till March 18, 1850, when it was consolidated with the expresses of Wells and co., and Butterfield, Wasson, and co. The

express line last named had been created about a year previous by John Butterfield. These three concerns, when united, were called the "American Express Company." William F. Harnden, the founder of the express business, died in 1848, leaving little or no property. In the mean time numerous short express routes and local expresses had come into successful operation throughout New England. Messrs. Pullen, Virgil, and Stone, who by their efficient services had contributed largely to the success of Harnden's business in its infancy, now started an express between New York and Montreal, and laid the foundation of the "National Express Company." Wells, Fargo, and co.'s California express was created in the city of New York in 1852. Adams and co.'s California express, established in 1849, was succeeded in 1855 by that of Freeman and co. In 1854 Adams and co., the Harnden express (then owned by Thompson and Livingston), Kinsley and co., and Hoey and co. were consolidated in a joint stock institution, now famous as the "Adams Express Company." The "United States Express Company" was commenced in 1858. It runs a through express twice a day to Buffalo, over the New York and Erie railway, and thence to numerous western cities, towns, and stations. Between New York and Dunkirk, and at all the stations upon its route, the New York and Erie railway company does an express business which was first established by the regular express company last mentioned. The "Hope Express Company," the "New Jersey Express Company," and the "Howard Express Company," established as joint-stock concerns since 1854, were founded upon successful individual enterprises of some years' standing prior to that date. They serve every part of New Jersey and Pennsylvania. The "Eastern Express Company" also is a union of several individual enterprises, consolidated Jan. 1, 1857. Its principal office is in Boston, whence its lines diverge by various railroad and steamboat routes into Maine and New Hampshire. Fiske and co., and Cheney, Fiske, and co., are proprietors of expresses which have been very useful in Massachusetts, New Hampshire, and Vermont. Massachusetts is remarkable for the number of its expresses, the most of which have short routes, and are operated by individual enterprise; 238 run from the city of Boston alone. The "American-European Express and Exchange Company," created in New York, July 1, 1855, was founded upon the business of Livingston and Wells, and Edwards, Sandford, and co. It sends and receives an express by every regular line of foreign steamships, and transacts business in London, Paris, and all the European cities.—The principal companies which are at present (1874) doing business in the United States are the Adams express company, the American, the United States, Wells, Fargo, and co., the southern express company, the national express company, the New Jersey, the

eastern, the United States and Canada, and the Texas. The railroads covered by the expresses are about 60,000 miles in length, but as they are traversed in both directions and often several times each day, it is estimated that the express messengers travel more than 300,000 miles daily. The whole number of men employed in the United States by all the expresses is over 18,000, the number of horses is about 8,500, and the number of offices about 8,000. The amount of capital employed in the business is estimated as being not less than \$25,000,000. The whole of this amount is not needed for the purpose of supplying material or for carrying on the business, and the larger part is held by the companies as a provision against any losses that may be sustained. The public in its dealings with the companies has therefore the protection of a large guarantee capital in addition to the individual liability of the shareholders. Confidence is reposed in express companies to such an extent that in times of financial panic, when merchants and others have for the time lost confidence in their banks and bankers, they trust the express companies in their fiduciary capacity and make use of them for the purpose of making their remittances and collections. A peculiar feature in trade has grown out of express facilities, called the "Collect on delivery business." Merchants whose wares are advertised or known now receive orders from strange firms in distant parts of the country to send goods to them by express, to be paid for on delivery. The merchant fills the order and sends the goods with his bill addressed to the consignee, marked C. O. D., and the amount to be collected, on the outside of the package. This is sent to its destination by the express company and tendered to the consignee, with the bill. Upon payment of the latter the goods are delivered to the new owner, and the money received is carried back to the consignor, who pays for the collection, while the consignee pays the freight on the package. The amount of business transacted in this way is very large and rapidly increasing.

EXTRADITION, the delivering up of fugitives from justice by the authorities of one country or state to those of another. This subject may be considered under two heads, as it relates to the surrender of offenders to each other by the several states of the American Union, or to the like mutual surrender between sovereign nations. I. BETWEEN THE STATES OF THE UNION. This is provided for by the constitution, art. IV. § 2 of which declares that a person charged in any state with treason, felony, or other crime, who shall flee from justice and be found in another state, shall, on demand of the executive authority of the state from which he fled, be delivered up to be removed to the state having jurisdiction of the same. An act was passed by congress in 1793 to carry this provision into effect, and to establish the like regulation for the territories; and the several states have also statutes on the same subject. The

general course under these statutes is the following: The accused is either indicted in the state where the crime is alleged to have been committed, or he is charged with the offence before a magistrate, who, after examining into the case, and being satisfied by evidence that the charge is well founded, issues his warrant for the arrest. A copy of the indictment or warrant is then presented to the executive of that state, who will give a formal requisition upon the executive of the state to which the accused has fled for his surrender. The executive upon whom the requisition is made, if the papers appear to be regular and sufficient, issues his warrant in compliance, directed to an officer or to the agent of the state making the requisition, which will be authority for the apprehension and removal of the accused. Some statutes authorize the supposed fugitive to be first complained of, examined, and committed where he is found, to await a requisition from the proper executive. It is settled under the constitutional provision cited above that persons are liable to extradition under it who having committed offences in one state are found afterward in another, whether their going to such other state was for the purpose of avoiding punishment or not; but it is also settled that one cannot be extradited to a state where he is not alleged to have been when the crime was committed. Thus, when Smith, the Mormon prophet, was charged with having in Illinois been accessory to the attempt upon the life of Gov. Boggs in Missouri, it was decided that he could not be regarded as a fugitive, and consequently could not be surrendered. The most important controversy under this provision has been as to the offences covered by it. It has been sometimes insisted that only those acts were to be considered crimes within its intent which were such at the common law, or at least which were punishable as crimes in the state upon which the demand was made; and cases occurred in which governors in the free states refused to surrender persons who were accused in the slave states of offences against the slave code. The last of these cases arose in 1859-'60, when a demand was made upon the governor of Ohio by the governor of Kentucky for the surrender of one Lago, who was accused of the crime of seducing a slave to escape from her master. The demand was refused, on the ground that the act was not an offence known to the laws of Ohio. Application was then made to the supreme court of the United States for a mandamus to compel a surrender; but that court, while declaring its opinion that the words "treason, felony, or other crime," as employed in the constitution, include every offence forbidden and made punishable by the laws of the state where the offence was committed, at the same time decided that the court had no power to compel the performance of executive duties by the governor of a state. Since the abolition of slavery, no similar controversy is likely to arise.

II. EXTRADITION BETWEEN SOVEREIGN NATIONS.

As a general rule, one nation does not undertake to punish offences not committed within its territories, though the offender may be found there. Many publicists, however, have expressed the view that nations owe to each other the obligation to surrender offenders who might have fled to them for an asylum; but this obligation, if it exists, must be regarded as imperfect, and as requiring stipulations to determine the occasions in which it may arise, and the manner of its exercise. Accordingly, though the extradition of offenders has been practised by some countries on grounds of comity only, it is now customary to make the obligation one of compact, in which the respective parties stipulate to what offences it shall apply, and what exceptions, if any, shall be made. There are two methods of making such compacts: one by legislation, where a country provides by its own laws that persons accused of offences abroad shall be subject to extradition on condition of reciprocity; the other by convention or treaty. The latter is the method usually adopted. In making such treaties it is customary to provide that they shall not apply to offences previously committed, or to those of a political character; though independent of any such express stipulation such cases, we think, must be considered impliedly excepted. It is sometimes provided, also, that the contracting nations shall not be bound to surrender their own subjects, though this exception would not be likely to be insisted upon unless under very peculiar circumstances. The United States has taken the lead in diplomatic negotiations on this subject, and we now have treaties for the mutual rendition of persons accused of offences as follows: With Great Britain (including all its possessions): murder; assault with intent to commit murder; piracy; arson; robbery; forgery or the utterance of forged paper. (Treaty of Aug. 9, 1842. This was an enlargement of Jay's treaty of 1794, which provided for the mutual rendition of persons accused of murder and forgery.) With the Hawaiian Islands: the same offences specified in the treaty of 1842 with Great Britain. (Treaty of Dec. 29, 1849.) With France: murder, comprehending the crimes designated in the French penal code by the terms assassination, parricide, infanticide, and poisoning; attempt to commit murder; rape; forgery; arson; embezzlement by public officers, when the same is punishable with infamous punishment; but this not to apply to offences previously committed, nor to those of a purely political character. (Treaty of Nov. 9, 1843.) To the above have been added robbery and burglary (treaty of Feb. 25, 1845); forging or knowingly passing or putting in circulation counterfeit coin or bank notes or other paper current as money with intent to defraud; embezzlement when subject to infamous punishment; and the case of accessories and accomplices, as well as principals, is included

(treaty of Feb. 10, 1858). With Prussia and the other states of the late North German Confederation: murder; assault with intent to murder; piracy; arson; robbery; forgery or the utterance of forged papers; the fabrication or circulation of counterfeit money, or the embezzlement of public moneys. (Treaty with Prussia of June 16, 1852, extended to all the states of the North German Confederation, Feb. 22, 1868. Similar treaties were made with Bavaria, Sept. 12, 1853; with Hanover, Jan. 18, 1855; and with Baden, Jan. 30, 1857.) With the Swiss Confederation: murder, including assassination, parricide, infanticide, and poisoning; attempt to commit murder; rape; forgery or the emission of forged papers; arson; robbery with violence, intimidation, or forcible entry of an inhabited house; piracy; embezzlement by public officers, or by persons hired or salaried, to the detriment of their employers, where these crimes are subject to infamous punishment. This not to apply to offences previously committed, or to those of a political character. (Treaty of Nov. 25, 1850.) With Venezuela: the offences specified in the treaty with the Swiss Confederation, with the addition of the counterfeiting of money, and with the like exception. (Treaty of Sept. 25, 1861.) With the Dominican Republic: the offences specified in the treaty with Venezuela. (Treaty of Feb. 8, 1867.) With Sweden and Norway: murder, including assassination, parricide, infanticide, and poisoning; attempt to commit murder; rape; piracy, including mutiny on board a ship whenever the crew or part thereof, by fraud or violence against the commander, have taken possession of the vessel; arson; robbery; burglary; forgery, and the fabrication or circulation of counterfeit money, whether coin or paper money; embezzlement by public officers, including appropriation of public funds. This not to apply to offences of a political character, or to any person who by its laws is a citizen or subject of the country on which the demand is made; and where the person demanded is charged with a new offence in the country in which he has sought an asylum, he is not to be delivered up until tried and acquitted or punished. (Treaty of March 21, 1860.) With Italy: murder, including parricide, assassination, poisoning, and infanticide; attempt to commit murder; rape; arson; piracy, and mutiny on board a ship, whenever the crew or a part thereof, by fraud or violence against the commander, have taken possession of the vessel; burglary; robbery; forgery and counterfeiting, and the uttering of forged or counterfeit papers, coin, or paper money; embezzlement of public moneys by public officers or depositaries, and embezzlement by persons hired or salaried to the detriment of their employers when subject to infamous punishment according to the laws of the United States, and to criminal punishment according to the laws of Italy. (Treaties of March 28, 1868, and Jan. 21, 1869.) With

Nicaragua: the same offences specified in the treaties with Italy. (Treaty of June 25, 1870.) With Austria: murder, assault with intent to murder; piracy; arson; robbery; forgery; fabrication or circulation of counterfeit money, whether coin or paper money; embezzlement of the public moneys. This not to apply to offences previously committed, or to offences of a political character, and neither to be bound to surrender its own citizens or subjects; and one accused of a new offence in the country to which he has fled, not to be surrendered until tried therefor and acquitted or punished. (Treaty of July 8, 1856.) With Mexico: murder, including assassination, parricide, infanticide, and poisoning; assault with intent to murder; mutilation; piracy; arson; rape; kidnapping, defining the same to be the taking and carrying away of a free person by force or deception; forgery, including the forging or making or knowingly passing or putting in circulation of counterfeit coin, or bank notes or other paper current as money; embezzlement of public moneys; robbery; burglary and larceny of cattle or other goods or chattels of the value of \$25 or more, when committed in the frontier states or territories of the respective countries. This not to apply to offences of a political character, or to persons held as slaves when the offence is charged to have been committed, or to crimes previously committed; and neither party to be obliged to deliver up its own citizens. (Treaty of Dec. 11, 1861.) With Hayti: murder, including assassination, parricide, infanticide, and poisoning; attempt to commit murder; piracy; rape; forging and the counterfeiting of money, and the utterance of forged paper; arson; robbery; embezzlement by public officers or by persons hired or salaried, to the detriment of their employers, when these crimes are subject to infamous punishment. This not to apply to previous offences, or to citizens of the country on which the demand is made. (Treaty of Nov. 8, 1864.) Besides these, there are conventions for the mutual return of deserters from ships, and treaties under which various Indian tribes bind themselves to surrender offenders to the United States; and the Creeks and Seminoles and the United States agree to a mutual surrender of offenders against their respective laws.—The several treaties with foreign countries require that, when requisition is made for an offender, before the surrender for extradition a judicial examination should be had, and that the surrender should only be made on such evidence of criminality as would justify the apprehension of the person and his commitment for trial where he is found if the offence had been there committed. By acts of congress passed to give effect to the treaties, the hearing is to be had before a federal judge or commissioner, or before a judge of a state court, who, if he finds the proper case established, will certify the fact with the evidence to the secretary of state,

that an executive warrant may issue for the surrender to the authorized agent of the foreign government. The surrender cannot be made until the judicial determination shall be had. In the well known case of Jonathan Robbins, arising under Jay's treaty, the president, while the case was pending before a judge, interfered with his advice and request that the accused should be delivered up, which was done accordingly; but this raised in the country such an outcry, and tended so strongly to the prejudice of the administration, that the like interference with judicial action is not likely again to occur. Nevertheless, the action of the judge is not conclusive on the executive; the one acting for the protection of individual right, while the other is to judge of the international obligation. While the executive cannot order the extradition until it is judicially determined that a *prima facie* case of guilt is shown, he is not, on the other hand, compelled to issue the warrant of extradition in compliance with the finding of the judge, if in his opinion the case is not within the treaty under which the proceeding is assumed to be taken. Thus, in the noted case of Karl Voght (1878), who was first demanded by Belgium for an offence committed in that kingdom, but whose extradition was refused on the ground that we had no treaty on the subject with that country, and who was subsequently demanded for the same offence by Prussia on the ground of being amenable to its laws as a Prussian subject, the president, on the opinion of the attorney general that the case was not covered by treaty, refused to issue his warrant of extradition, notwithstanding that the district judge before whom he had been brought had determined that a case was made out, and had given the proper certificate. In this the president followed the judicial decisions in England. The several states, not being at liberty under the constitution to form treaties or conventions with foreign powers, cannot surrender accused persons to those powers.—Great Britain has treaties of extradition, besides that with the United States, with France, Denmark, Germany, Belgium, Italy, and Austria (1874). The first, dated Feb. 3, 1843, only embraces murder (including assassination, parricide, infanticide, and poisoning), attempt to murder, forgery, and fraudulent bankruptcy. That first made with Denmark included only the same four offences, but is now greatly enlarged, and, like those with Italy and Belgium, corresponds in comprehensiveness to the treaty with Germany of 1872. The offences specified in that are: murder; attempt to murder; manslaughter; counterfeiting or altering money, or uttering the same; forgery or the uttering of forged papers, bank notes, or paper money; embezzlement; larceny; obtaining money or goods by false pretences; crimes against the bankrupt laws; fraud by a bailee, banker, agent, factor, trustee, director, member, or public officer of any company when made criminal; rape; abduc-

tion; child stealing; burglary or housebreaking; arson; robbery; threats by letter or otherwise with intent to extort; sinking or destroying a vessel at sea, or attempting to do so; assaults on board a ship on the high seas, with intent to destroy life or to do grievous bodily harm; revolt or conspiracy to revolt on board a ship on the high seas against the authority of the master. Extradition may take place for participation in any of the crimes specified, provided such participation be punishable by the law of both countries. By statute 33 and 34 Victoria, c. 52, contemplating further treaties of the same nature, it is provided that effect may be given to any such treaty by mere order in council, and without special parliamentary sanction, which otherwise would have been necessary. Most of the European treaties of extradition are very recent, and they are likely soon to be adopted among all Christian nations.

EXTREME UNCTION, a sacrament of the Roman Catholic church, and of the Greek and other eastern churches, administered for the spiritual and bodily relief of the sick. The Greeks call it the "oil of prayer." The Scriptural authority on which this rite is founded is taken from St. James v. 14, 15. In the Latin church it is called extreme or "last" unction, because, unlike the unctions of baptism, confirmation, and holy orders, this is reserved for the last hour. The effects of this sacrament are held to be the following: spiritual strength to overcome the enemies of salvation in the final struggle of the dying hour, and patience to support the pains and discomforts of illness; the indirect forgiveness of all mortal sins of which the sufferer may be unconscious, and the direct remission of venial sins; the removal of the weakness of the spiritual faculties caused by the habits of sin; and restoration to health when it is for the welfare of the patient. The sacrament is administered by the priest, who anoints with consecrated oil the eyes, ears, nostrils, mouth, hands, and feet of the sick person, praying at each unction that the Lord by his mercy and through that unction will remit the sins committed through each sense.—The various eastern churches, Greek, Armenian, Coptic, and Nestorian, agree with the Latins in regarding this as one of the seven sacraments instituted by Christ; but they differ in that they do not reserve its use for the sick in danger of death. Moreover, in the Greek church it is sometimes administered by as many as seven priests at the same time, but ordinarily by two. The Greek form of words does not substantially differ from that employed by the Latins.

EYALET. See **VILAYET**.

EYCK, Van, the name of three painters, two brothers and a sister, regarded as the founders of the Flemish school, probably the children of Josse van Eyck, a painter, and born at Eyck (now Alden Eyck), a village in the bishopric of Liège, near Maaseyck, on the Maas. I.

Hubert van, born in 1366, died in Ghent, Sept. 18, 1436. After having resided for some time in Bruges, he removed with his brother to Ghent, where he was employed with him upon an altarpiece for the church of St. Bavon. He died before its completion, and was buried in that church. **II. Jan van** (often called Jan van Brugge), born about 1390, died in Bruges in 1440 or 1441. Much difference of opinion has prevailed in regard to the precise date of his birth, and as to which of the two brothers was the greater painter; but it would seem to be sufficiently well established that Jan was much younger than Hubert, and was instructed by him. Their most celebrated work was the altarpiece in the church of St. Bavon. It was about 14 ft. wide and 12 ft. high, and contained 12 pictures, painted upon folding doors or screens, representing the adoration of the mystical lamb, other pictures being painted upon the reverse of some of the doors. When the French obtained possession of Belgium, Napoleon caused the doors to be carried to Paris, whence they were removed in 1815. The four central divisions were restored to Ghent, and are now in the church of St. Bavon; the six most important of the doors were taken to Berlin, and form one of the finest ornaments of the royal museum; and two of the doors are in the museum at Brussels. A fine copy of the whole altarpiece was made by Michael Coxie for Philip II. of Spain, part of which is in the Berlin museum, part in the Pinakothek at Munich, and part in the church of St. Bavon at Ghent. The brothers made such great improvements in the art of oil painting that its invention has been often, though erroneously, ascribed to them. The mixture of oils and gums which they used as the vehicle for their pigments was so excellent that the colors of their great work still retain a wonderful freshness. They discarded the artificial style of their predecessors, and endeavored to reproduce the outlines and hues of nature. Although Jan adhered in his early efforts to the flat gold background which had before been customary, he afterward adopted a more natural grouping for his figures and natural scenes for a background. The example of the brothers exerted a great influence upon the painters of Germany, Italy, and Spain, and contributed to the emancipation of art from conventional traditions. Jan was the court painter of Philip the Good, duke of Burgundy, and in 1428, while the painting of the altarpiece was in progress, accompanied the embassy which was sent by him to Lisbon to sue for the hand of the daughter of King John I. of Portugal. After the completion of the altarpiece in 1432, he returned to Bruges, and little is known of his subsequent life. **III. Margaret van**, died about 1430. She remained unmarried in order that she might devote herself to painting in connection with her brothers. There is in London a fine picture by her, in three parts, of the Madonna and child.—

See Waagen, *Ueber Hubert und Jan van Eyck* (Breslau, 1822), and "Early Flemish Painters," by Crowe and Cavalcaselle (London, 1856).

EYE, the organ of the special sense of vision, lodged in man in a cavity on each side of the upper portion of the face, called the orbit. The orbits have the form of a quadrangular pyramid of which the base is in front and the summit behind; their direction is horizontal, and their axes, directed backward and inward, would cross at or near the sella tursica of the sphenoid bone in the cranial cavity. They have four triangular surfaces, the upper formed by the orbital plate of the frontal and the lesser wing of the sphenoid bone; the lower by the palate behind, the upper maxillary in the middle, and the malar in front; the external by the sphenoid behind and the malar in front; the internal by the sphenoid behind, the ethmoid in the middle, and the lachrymal bone in front. The cavity has at its upper external portion a depression for the gland which secretes the tears, at its inner portion the commencement of the bony passage to the nose; at the summit is the round opening for the entrance of the optic nerve, the union of the sphenoidal, sphenomaxillary, and pterygomaxillary fissures, and the commencement of the suborbital canal. Besides these bony enclosing cavities, the eyes are protected from dust and foreign bodies by the hairs of the eyebrows above, and in front by the movable lids,

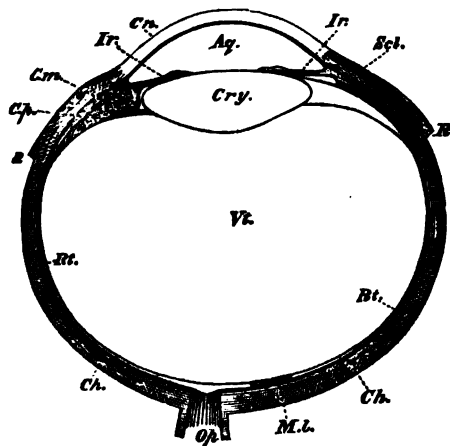


FIG. 1.—Horizontal Section of the Eyeball.

Scl., sclerotic coat; *Cr.*, cornea; *Rt.*, attachments of the tendons of the recti muscles; *Ch.*, choroid; *Cp.*, ciliary processes; *Cm.*, ciliary muscle; *Ir.*, iris; *Aq.*, aqueous humor; *Cry.*, crystalline lens; *Vt.*, vitreous humor; *Rt.*, retina; *Op.*, optic nerve; *M.L.*, the yellow spot. The section has passed through a ciliary process on the left side, and between two ciliary processes on the right.

fringed with the eyelashes. The globe of the eye is of a generally spherical shape, the anterior fifth being the segment of a circle smaller than that of the rest of the organ; the anteroposterior diameter, greater than the transverse, is 10 or 11 lines; differing from the axes of the

orbita, the axes of the eyes are parallel. In front, the globe of the eye is in relation with the reflection of the mucous membrane of the lids; behind and all around, with the muscles, vessels, nerves, and a cushion of soft fat. The eye is composed of membranes and humors. Of the membranes of the eye, the cornea has already been described under its own title; the others are the sclerotic, choroid, ciliary processes, iris, and retina. The sclerotic is the external membrane, forming the posterior four fifths, the anterior fifth being formed by the cornea; it is white, firm, and resisting, opaque, thick, and composed of interlaced fibres. Beneath the sclerotic is the choroid, composed of small arteries and veins united by delicate areolar tissue; it extends from the entrance of the optic nerve forward to the ciliary circle; both its surfaces are covered with a dark pigment, which gives the deep color seen in the interior of the eye. The ciliary circle or ligament is a grayish ring, a line or two wide, united by its larger circumference to the choroid, and by its lesser to the iris; the ciliary processes are membranous folds, 60 to 80 in number, extending from the choroid to the neighborhood of the opening of the pupil; they form by their union a ring behind the iris and in front of the vitreous humor, surrounding the crystalline lens like a crown. At a short distance behind the cornea is the circular, vertical, membranous curtain, the iris, pierced in the middle by the pupil; this curtain hangs in the aqueous humor, separating it into the anterior and posterior chambers of the eye; it presents anteriorly a great number of radiations converging toward the pupil, the muscular fibres for the dilatation of this opening, and is variously colored in different individuals; the posterior surface has a number of circular fibres for contracting the pupil, and is covered with a thick dark pigment layer called *uvæa*; both surfaces are lined with the delicate membrane of the aqueous humor; the greater circumference is connected with the ciliary ligament and processes; its movements are doubtless partly owing to its erectile and vascular tissue. Beneath the choroid is the retina, a thin soft expansion of the optic nerve, surrounding the vitreous humor and extending forward as far as the ciliary processes and crystalline lens; about two lines to the outside of the tubercle of the nerve it presents a circular dark spot and a small perforation discovered by *Sömmering*. The retina is the immediate organ of vision, which receives the rays of light and transmits the visual impressions by the optic nerve to the sensorium. Of the humors of the eye, the crystalline lens has been described under that head; the others are the aqueous and vitreous humors. The aqueous humor is a limpid transparent fluid, varying in quantity from four to six grains, occupying the space in front of the lens which is divided into anterior and posterior chambers by the iris; it contains in solution a little albumen and the salts usually found in such secre-

tions; when lost by accident or in the operation for cataract by extraction, it is speedily formed again. The vitreous humor occupies the posterior three fourths of the globe of the eye, having the lens encased in its anterior portion; it consists of a transparent, gelatinous fluid enclosed in a great number of cells formed by the partitions of the hyaloid membrane, communicating with each other; in the operation for cataract by depression the lens is pushed backward and downward into this humor. The optic nerves are the second pair of cerebral nerves. The globe of the eye is moved by six muscles arising from the contour of the optic foramen and its vicinity, and attached to the sclerotic coat; of these muscles four are straight, called the external, internal, superior, and inferior *recti* muscles, moving the eye respectively outward, inward, upward, and down-

C.A. 21

FIG. 2.—Muscles of the Eyeball viewed from above and from the inner side.

S. R., superior rectus; *Inf. R.*, inferior rectus; *E. R.*, external rectus; *Int. R.*, internal rectus; *S. ob.*, superior oblique; *Inf. ob.*, inferior oblique; *Ch.*, chiasma of the optic nerves (*II.*); *III.*, the third nerve, which supplies all the muscles except the superior oblique and the external rectus.

ward. The first two muscles are often permanently contracted, producing divergent or convergent strabismus, a deformity curable by the division of the contracted muscles, a simple and comparatively painless and bloodless operation; the superior oblique muscle passes through a pulley in the inner portion of the orbital process of the frontal bone, from which it extends to the posterior and external part of the globe, rotating the organ inward and forward; the inferior oblique passes from the internal and anterior part of the floor of the orbit to the external and posterior surface of the globe, rotating the eye outward and upward. The conjunctiva, the mucous membrane of the eye, is reflected from the lids and covers the anterior portion of the globe; it is in this membrane that the redness and swelling of ordinary ophthalmia have their seat. The eye is frequently destroyed by accident or disease; in cases of removal of the organ artificial eyes are used to remedy the deformity; these are made of glass and enamel, and when having the natural size, shape, coloration of iris, form of pupil, projection of cornea, tint of sclerotic, and vascularity, it is often very difficult to detect the real from the artificial organ, especially

when the accurate fitting of the latter allows it to be moved by the muscles acting in sympathy with the sound eye.—Without here treating of the laws of refraction, of the aberration of sphericity, and of other optical principles involved in vision, it will be sufficient to say that the rays from an object are first modified by the convex cornea, pass across the aqueous humor through the pupil-opening of the iris, thence through the dense crystalline lens and the vitreous humor, and are by these media of different densities and shapes converged at the proper focal distance on the retina. All rays beyond those necessary for perfect vision are absorbed by the pigment layer of the choroid, which answers the purpose of the black interior of optical instruments; the iris, like the telescopic diaphragm, shuts off the rays from the circumference of the lens, thus correcting the aberration of sphericity, contracting or dilating the pupil according to the brilliancy or dimness of the illumination of the object, or its distance from the eye; it is well known that the pupil of a cat in a bright light becomes diminished to a vertical slit. As the rays are crossed in the lens, an inverted image is formed on the retina, though the mental perception is of an erect image. Not only spherical but

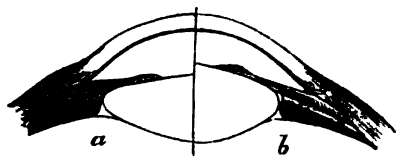


FIG. 8.—Illustration of the change in the form of the lens when adjusted—*a* to distant, *b* to near objects.

chromatic aberration is corrected sufficiently for all practical purposes in healthy eyes by the different refractive powers of the media and by the different curves of their surfaces, so that the image on the retina is well defined and free from false colors. The power by which the eye adapts itself instantly to variations in the distance of objects depends upon a change in the curvatures of the crystalline lens, this body becoming more convex, and consequently more highly refractive, in vision for near objects, less so in vision for remote objects. The physiology and defects of vision will be more properly treated in the article Vision; for recent observations by Kölliker on the structure of the different layers of the retina, the reader is referred to the works of Dr. Carpenter on the principles of human and comparative physiology. The pupil is diminished by the action of muscles deriving their nervous influence from the third pair, but is dilated through the influence of the cervical portion of the sympathetic nerve. The movements of the eyeballs, whenever voluntary, are always harmonious, but not necessarily symmetrical; though one cannot be elevated and the other depressed at the same time, one may be turned outward

and the other inward when the axes of the eyes are turned toward an object on either side of the head. The muscles of the eyeball are moved principally through the third pair of nerves, the *motores oculorum*, but the superior oblique has a special nerve, the fourth pair, and the external recti the sixth pair; the sensibility of the eye is derived from the ophthalmic branch of the fifth pair; by the ophthalmic or ciliary ganglion the sensory branches of the fifth pair, the motor branches of the third pair, and the sympathetic filaments are united together. The vascular supply of the globe of the eye is derived from the ophthalmic branch of the internal carotid artery.—The complicated eye of the mammal and bird becomes more simple in reptiles and fishes, losing the eyelids, and in the articulates generally losing all that is anterior to the vertebrate crystalline lens, as well as mobility, the latter loss being supplied by the multiplication of the organs or facets. The mammalian eye is constructed to suit the circumstances of the life of the animal; of large size in ruminants and rodents, it is small in moles, bats, and cetaceans, and in the latter flattened anteriorly as in fishes. The eyes are generally placed laterally, but in the nocturnal species they are directed forward as in man; the lachrymal caruncle at the inner angle has in man only a rudiment of a nictitating membrane, which is more developed in some mammals, but remarkably in birds; the sclerotic is thicker in animals whose eyes vary much from a sphere, especially posteriorly, this membrane in a whale with an eye of the size of an orange being an inch thick behind; the choroid, dark in man, in the carnivora, ruminants, and other orders, reflects vivid metallic colors, remarkably brilliant at night, from the depth of the organ. In animals and man destitute of the usual coloring matter of the surface, or in albinos, the iris is pink, from the color of the blood circulating in its vessels; during foetal life, until the end of the seventh month, the pupil is closed by a membrane. The foramen of Sömmerring is said not to exist in any mammals below the quadrumana; the tear gland is found in all except cetacea. In birds the sclerotic becomes more or less strengthened by cartilage, and in the neighborhood of the cornea is provided with a series of bony plates, arranged in a circle, and overlapping each other; but the chief peculiarity consists in the *pecten*, folded like a comb or fan, and projected forward toward the lens; it is vascular like the choroid, though not connected with it, and is dark with pigment; its use is not satisfactorily ascertained. Many species of reptiles have osseous pieces in the sclerotic; snakes have no movable lids; the chameleon has a single circular lid. In fishes the eyes are generally large, the sclerotic thick, and in some (as the tunny) osseous anteriorly; they have neither lids, except the most rudimentary, nor lachrymal glands; the cornea is very flat, and

the lens dense; around the entrance of the optic nerve there is a very vascular, horse-shoe-shaped organ, between the layers of the choroid, called the choroid gland or muscle. The organs of vision in insects consist of simple or of compound eyes, the former occurring chiefly in larvæ, the latter in perfect insects; they are wholly absent in some larvæ, and both forms coexist in the perfect state of many. The simple eyes (*ocelli* or *stemmata*) consist of a convex cornea, behind which is a lens, lodged in an expansion of the optic nerve, and surrounded by a variously colored pigment layer; they vary in number from two to more than 100, and are situated on the head. The compound eyes are made up of simple eyes so closely placed that their facets or cornæ are contiguous; behind each cornea is a transparent pyramid whose interior apex is received into a kind of vitreous body, surrounded by the nerve and the choroid; there are sometimes many thousand facets in these eyes, which may cover nearly the whole head, and hairs may project at their angles. In the arachnids the eyes are simple, and the orders have been characterized by their number, situation, and direction; they are most numerous in the scorpions. The sense of sight is present in almost all crustacea; their simple eyes consist of a cornea with a lens and pigment layer; a usual form is that of many simple eyes, placed close together, and covered by a common cornea; sometimes there is a faceted cornea under the simple one; the highest forms have compound faceted eyes, in many situated at or near the end of two peduncles movably articulated to the cephalo-thorax and concealed in special fossæ; these facets are very numerous, and behind each is the usual lens and pigment. The eyes of cephalopods are very large and highly developed, resembling in some respects the vertebrate organ; there is generally an ocular bulb, and a capsule constituted by a cartilaginous orbit and a fibrous continuation of the cutaneous envelope, which takes the place of a cornea; semi-lunar folds containing muscular fibres cover the eye like lids; in front of the globe is a space analogous to an anterior chamber, containing a serous fluid, and in the octopods communicating externally; internally this chamber is closed by a kind of pupil; its serous membrane has a silvery lustre; in some species the lens is in direct contact with the water in which they swim; there is an iris, sclerotic, vitreous liquid, a spherical brownish lens formed of concentric layers, a ciliary body, and pigment layer; in the nautilus the eyes are placed on a projecting stalk, but in others are generally deeply sunk in the head. In the cephalophora (including pteropoda, heteropoda, and gasteropodous mollusks) eyes are generally present, never more than two in number and comparatively small; they are almost always connected with the tentacles, either at their base, sides, or extremities. In acephalous mollusks eyes

are very common and numerous, occupying the borders of the mantle or confined to the orifices of the tubes, and are either pedunculated or sessile. In the annelids the eyes are generally either wanting entirely, or are merely able to distinguish light from darkness; but the leeches have from two to ten undoubted eyes. In the helminths there appear to be no eyes, only pigment spots containing no light-refracting body. Below these are found in the radiata various eye specks and pigment dots which doubtless in some cases are true eyes, but authors are not yet agreed as to the light-refracting powers of most of these organs. The eye of the blind fish of the Mammoth cave, Kentucky, though unable to form a distinct image, can doubtless distinguish light from darkness through the areolar tissue and skin which cover it; Prof. J. Wyman has found in it a lens, sclerotic, choroid, retina, and optic nerve, and it is therefore constructed on the vertebrate plan, rather than the invertebrate to which it has generally been compared; the parts in connection with the nervous system are developed, while those which are formed by inversion of the integuments are mostly absent; some authors are of opinion that the stimulus of light for several generations would retransform this eye into an ordinary organ of vision.

EYE STONE, the operculum or calcareous mouthpiece of certain species of small univalve shells. The stony-like substance, one third of an inch or less in its largest dimensions, presents a form like that of a turtle, a convex surface upon a plane base; and being placed on a smooth plate in a weak acid, as lemon juice, the evolution of carbonic acid gas from the carbonate of lime of which it is composed lifts it up and causes the stone to move about as if alive. A similar effect resulting from chemical decomposition is sometimes observed in animal bodies; and loaves of bread, Humboldt remarks, have been observed to move in like manner in the oven, whence the ovens have been called enchanted. He found the little opercula, called *pedras de los ojos*, or eye stones, regarded as great mysteries by the inhabitants of the coast of Venezuela near Cumaná. They collected them in great quantities on the beach at Cape Araya, and made use of them to extract dust or any foreign substance from the eye, a purpose for which they are still collected and exported, and are kept by druggists. Being introduced under the lid of the eye, the stone moves about by the motion of the organ, and any little particles it comes in contact with adhere to it and are finally removed with it.

EYLAU, or **Ellau**, a town of Prussia, province of East Prussia, in the district and 22 m. S. S. E. of the city of Königsberg; pop. in 1871, 8,723. It is situated on the Pasmur, a small tributary of the Alle, contains an old castle, and has manufactories of cloth, hats, and leather. Here on Feb. 7 and 8, 1807, was fought a battle

between the French under Napoleon, 85,000 strong with 350 guns, and the Russians and Prussians, 75,000 strong with 460 guns. The total number of killed and wounded was nearly 40,000, and both sides claimed the victory. In this battle Napoleon was nearly made prisoner, but was saved by his own presence of mind and the heroism of his little body guard of 100 men.—This town is called Preussisch Eylau, to distinguish it from Deutsch Eylau, a small town of West Prussia, in the district of Marienwerder, 70 m. S. S. W. of the former, at the S. extremity of Lake Geserich.

EZEKIEL, the third of the great Hebrew prophets, and contemporary with Jeremiah and Daniel, lived in the 7th and 6th centuries B. C. He was still young when he went into captivity, following King Jehoiachin to Babylon. There, on the banks of the Chebar, supposed to be the Chaboras in Mesopotamia, in the fifth year of his exile, he began his prophetic career, declaring to his fellow exiles the misfortunes which were besetting and threatening Jerusalem and the country of Judah. In the 25th year of his exile he described the new temple which was to rise in Jerusalem after the redemption of his people. This is one of the last prophecies remaining from him, and there is no account of him beyond the 27th year of the captivity of Jehoiachin. According to a doubtful tradition, he was assassinated by one of the exiled princes, and during the middle ages his tomb was pointed out between the Euphrates and the Chebar. His book, which abounds in visions, poetical images, and allegories, is divided into three parts: the first (ch. i. to xxiv.) was written before the destruction of Jerusalem; the second (ch. xxv. to xxxii.) contains prophecies against foreign nations; the third (xxxii. to xlvi.) foretells the resurrection of Israel and the erection of the new temple. The genuineness of the book has never been doubted; but our present Hebrew text is among the most corrupt of the books of the Old Testament. The best commentaries are those of Umbreit (1843), Hävernick (1843), Hitzig (1847), and Ewald (2d ed., 1868).

EZRA, a Jewish scribe and priest, according to Josephus, high priest of the Jews in Babylon. Under his guidance, the second expedition of the Jews proceeded from Babylon to Palestine, under the reign of Artaxerxes I., about 458 B. C. The important services rendered by Ezra to his countrymen on that occasion, and also in arranging and settling the canon of Scripture, are specially acknowledged by the Jews, so that he is even regarded as the second founder of the nation. Josephus says that Ezra died at Jerusalem, and was buried there with great magnificence; according to others, he returned to Babylon and died there, at the age of 120. Ezra is said by some of the rabbis to have introduced the present square Hebrew characters, and, in conjunction with some of the elders, to have made the Masora, the punctuation and accentuation of the Bible.

Besides the book of Ezra, he was supposed to be the author of the two books of Chronicles, and some writers attribute to him also the books of Nehemiah and Esther, though they differ in style from his acknowledged writings.—The book of Ezra contains an account of the favors bestowed upon the Jews by the Persian kings, the rebuilding of the temple, the mission of Ezra to Jerusalem, and the various regulations and reforms introduced by him. The theologians of the liberal school generally attribute the last revision of the book to a later hand than that of Ezra. Bertheau (in Schenkel's *Bibellæxicon*, 1868) puts the date of the last revision about 300 B. C.; others, after the example of Spinoza, in the time of the Maccabees. Parts of the book are written in Chaldee (iv. 8 to vi. 18, and vii. 12 to 26). For a full discussion of the questions relating to the book of Ezra, see the introductions of Berthold, De Wette, Keil, and Hävernick, and the commentary of Bertheau (1862).—In ancient manuscripts there are four books of Ezra, viz., the one just spoken of, the book of Nehemiah, and the two books which in the English version are called 1st and 2d Esdras, and placed among the apocryphal books. (See *ESDRAS*.)

EZZELINO (or *Eccelino*) **DA ROMANO**, a leader of the Ghibellines in Italy, born at Onaro, April 26, 1194, died at Soncino, Sept. 26, 1259. He belonged to a German family which in the 11th century had acquired large feudal possessions in Lombardy, and whose principal seat was the castle of Romano near Padua. He was the fourth of his name, and is known in history as Ezzelino the Tyrant. From his youth he entered into the quarrels of the time, and war having become general in Lombardy, he remained faithful to the emperor Frederick II. His lands being ravaged by the Guelphs, he invited the help of the emperor, who relieved him and gained noteworthy advantages. In 1236 Ezzelino, with his brother Alberic, gained possession of Verona and Vicenza, and he became podesta of Verona, and his brother of Vicenza. In February, 1237, after the return of the emperor to Germany, he took Padua. He subsequently captured Treviso, and imprisoned many eminent people on suspicion of disaffection to him; and from this time his oppression and cruelty became conspicuous. The emperor returned with reinforcements, and they gained the victory of Cortenuova, Nov. 27, 1237. The following spring he married a natural daughter of Frederick. In 1239 he was excommunicated by the pope. In 1240 he was intrusted with the conduct of the war in Lombardy, and lost Ferrara; but in 1246 he repulsed the marquis of Este, and subsequently he took Verona, Feltre, Belluno, and even Este. By 1250, when the emperor died, he had extended his control from the Adriatic to the suburbs of Milan. A league was formed against him in 1252 by most of the Lombard cities, the marquis of Este, and others, including his own brother Alberic, and in 1256 a

crusade was proclaimed against him; but he still successfully resisted all combinations, and in the latter year he besieged Mantua. A new league being formed against him, which was joined by Venice, the allies invested and captured Padua, which was held by his nephew Ansedisio. But Ezzelino defeated the army of the league near Brescia, and captured that city

Sept. 1, 1258. In 1259 he threatened Milan, but it was saved by Martin della Torre; and Ezzelino's retreat being cut off, he was forced into a battle near Soncino, in which he was severely wounded and captured (Sept. 16), and his army dispersed. He refused food, tore the bandages from his wounds, and died without reconciliation to the church.

F

F, THE 6th letter of the English and Latin, the 20th of the Arabic, and the 23d of the Persian alphabet, indicates a labio-dental sound, produced by the passage of the expired air between the lower lip and the upper incisive teeth, while the glottis and larynx are almost at rest. Quintilian calls this sound "scarcely human," since it is a mere afflatus, and is wrongly placed among the semi-vocals. Its sonorous parallel is the softer sound of V (as in English), in producing which the glottis and larynx are engaged. F is represented in ancient Greek both by the ϕ (*ph*) and the digamma, in corresponding words; but the sound of the former was less harsh and rather aspirated than blowing (*efflatus*), and the latter sounded almost like our V. The figure of the Latin F arose from the doubling of the Greek Γ . The emperor Claudius is reported to have used it inverted (\mathbb{J}) to represent V. As a numeral sign for 6, the stigma was employed by the Alexandrines, as one of the three *ἐπισημα*, instead of this digamma, which is named *σάυ* or *vau*. The shape of the stigma (ς) is an inverted Oscan and Umbrian F (\sqcap). We find the prototype of our cursive *f* on ancient Hebrew coins; but in the present so-called Hebrew, as in the Syriac, Sabaic, Palmyrenic, and some other kindred writings, the *vau* takes the place of F, and indicates the sounds of *v* and *u*. F occurs in the same place also on the Idalian tablet of Cyprus, in Lycian, also in Tuarik (Berber), and in some other writings. In the Cyrillic alphabet the *phert* and *phis* (ϕ) correspond to it as the 27th letter, in Glagolitic as the 23d, and in Russian as the 27th. F is the first rune, and it is represented hieroglyphically by a horned snake. It is often vicariously converted into other letters or sounds, especially into labials, as in the following examples: Lat. *frater*, *frango*, *fagus*, Eng. *brother*, *break*, *beech*; Lat. *pes*, *pugnare*, *porculus*, Eng. *foot*, *fight*, Ger. *Ferkel*; Lat. *ferrum*, *filius*, *folium*, *fugere*, *formosus*, *fabulari*, *fames*, *furari*, Span. (since the 14th century) *hierro*, *hijo*, *hoja*, *huir*, *hermoso*, *hablar*, *hambre*, *hurtar*. The Greek ϕ the Italians, Spaniards, and Portuguese uniformly replace by *f*. F sometimes also interchanges with gutturals, as Germ. *Schacht*, Eng. *shaft*; Dutch *achter*, Eng. *after*; Germ. *kriechen*, Eng. *creep* and *crafty*. In English and French it alternates with *v*

in grammatical forms, as *wife*, *wives*; *natif*, *native*. The Greek θ sometimes becomes *f*, as *Theodoros*, Russ. *Fedor*; *θηρα*, *θηρα*, Lat. *fores*, *fera*. Very peculiar are the transformations of the Latin *fl* (also *pl*) into Spanish *ll* and Portuguese *ch*; as *flamma*, Span. *llama*, Port. *chamma*, &c. The Devanagari, and most graphic systems of eastern Asia derived from it, have no F. The sound exists in the Chinese and Japanese languages. Most American languages are guttural, and lack among others the sound of *f*.—As a numeral in the middle ages, F was equivalent to 40, and \overline{F} to 40,000. It signifies 80 in Arabic, and 10,000 in Armenian. Its substitute *ph* stands for 500 in Russian and Georgian; while the Phœnician, Chaldaic, and Syriac *vau* designated 6. As an abbreviation, F stands for *filius*, *fecit*, Flavius, Fahrenheit; for *forte* in music, and *ff* for *fortissimo*. F is marked on the French coins of Angers, on the Prussian of Magdeburg, and on the Austrian of Hall in the Tyrol. In music, it denotes the fourth diatonic interval, or the sixth string on the piano in the chromatic scale, and is called *fa* in the solfeggio.

FABER, Frederick William, an English clergyman and author, born June 28, 1814, died Sept. 26, 1863. He was educated at Oxford, and became rector of Elton in Northamptonshire, which office he filled until his conversion to the Roman Catholic faith, which was formally consummated Nov. 17, 1845. His published writings up to that time were as follows: "Tracts on the Church and the Prayer Book" (1839); "A Sermon on Education" (1840); "The Cherwell Water Lily and other Poems" (1840); "The Styrian Lake and other Poems" (1842); "Sights and Thoughts in Foreign Churches" (1842); "Sir Lancelot, a Poem" (1844); "The Rosary and other Poems" (1845); and several papers in the "Lives of the English Saints," edited by the Rev. Dr. Newman. Dr. Faber was ordained priest in 1847, joined Dr. Newman, who had just transplanted the Oratory of St. Philip Neri to England, in 1848 received the habit of that congregation, and became distinguished as an earnest and eloquent preacher. His published writings after his conversion are as follows: "Catholic Hymns," and an "Essay on Beatification and Canonization" (1848); "The Spirit and Genius of St. Philip Neri" (1850); "Catholic Home Mis-

sions" (1851); "All for Jesus" (1854); "Growth in Holiness" (1855); "The Blessed Sacrament" (1856); "The Creator and the Creature" (1857); "The Foot of the Cross, or the Sorrows of Mary," "Sir Lancelot" (being his former poem rewritten), and "Ethel's Story Book" (1858); and "Spiritual Conferences" (1859). Several years before his death he became superior of the Oratory at Brompton. —See Bowden's "Life of F. W. Faber" (1869).

FABER, George Stanley, an English theological writer, uncle of the preceding, born Oct. 25, 1773, died near Durham, Jan. 27, 1854. He studied at the university of Oxford, where he became a fellow and tutor of Lincoln college, was appointed Bampton lecturer in 1801, and in the same year published his discourses under the title of *Horæ Mosaicæ* (2d ed. enlarged, 1818). He took the degree of B. D. in 1803, married, gave up his fellowship, and for two years assisted his father, the rector of Calverley in York, as curate. He subsequently occupied various vicarages, in 1831 was made prebendary of Salisbury, and in 1832 appointed master of Sherburn hospital. He wrote a large number of works, most of which, particularly those on prophecy, in which he holds that the inspired predictions apply not to individuals but to governments and nations, have had a wide popularity. Among the most important are: "Dissertation on the Mysteries of the Cabiri, or the Great Gods of Phœnicia" (2 vols. 8vo, Oxford, 1803); "The Origin of Pagan Idolatry" (3 vols. 8vo, 1816); "Difficulties of Romanism" (8vo, 1826); "The Sacred Calendar of Prophecy" (3 vols., 1828); "Papal Infallibility" (8vo, 1851); and "The Revival of the French Emperors'hip anticipated from the Necessity of Prophecy" (12mo, 1853; New York, 1859).

FABIUS, the name of an ancient Roman gens, which claimed to be descended from Hercules and the daughter of the Arcadian Evander. Of the various families which belonged to the gens *Fabia*, the most ancient was that of the Vibulani, three brothers of which were consuls for seven years in succession (485–479 B. C.). These brothers rendered themselves odious to the common soldiers by refusing to divide among them the booty gained in war, and by their opposition to the agrarian law, but afterward became popular by their courage in a battle fought with the Veientes in the consulship of Marcus Fabius, in 480. In this battle Quintus Fabius was killed, and his brothers Marcus the consul and Cæso were foremost in the fight. The soldiers bravely supported them, and after the battle the Fabii espoused the cause of the plebeians and were regarded by the patricians as apostates. They gained high honor by offering to undertake alone the war against the Veientes. The whole family, with the exception of a single member, to the number of more than 300, left Rome with their followers, fortified themselves upon the banks of the Cremera, and prosecuted the war with

great energy. But in the consulship of Horatius (477) Pulvillus and T. Menenius Lanatus they were all, after heroic resistance, overwhelmed and destroyed. The only member of the family who survived was Quintus, son of Marcus, who had remained at Rome, and from him were descended the Fabii who afterward became famous in Roman history. Among them, Quintus Fabius Rullianus is commonly considered the first who had the cognomen Maximus. In 325, as master of the horse, he gave battle to the Samnites, contrary to the express orders of the dictator L. Papirius Cursor, and obtained a signal victory. After other brilliant victories, in 295, being consul for the fifth time, he was in command at the great battle of Sentinum, and defeated the combined armies of the Samnites, Gauls, Etruscans, and Umbrians. He is reputed among the most eminent of the Roman generals, but the principal authorities in regard to this period belonged to the Fabian house, and it is probable that his military achievements have been much exaggerated.—According to Polybius, it was not Q. Fabius Rullianus upon whom the cognomen of Maximus was originally conferred, but his great-grandson, Quintus Fabius Maximus Verrucosus, who by his prudent generalship in the second Punic war saved the Roman commonwealth from impending ruin. Having been appointed dictator after the defeat of Lake Trasymenus, in 217, he perceived that it was impossible with raw and disheartened troops to oppose successfully a veteran army flushed with victory. He therefore avoided pitched battles and moved his camp from highland to highland, where Hannibal's Numidian horse and Spanish infantry could not follow him. He thus tired them out with marches and counter-marches. This policy gained for him the title of *Cunctator*, delayer. It was admirably suited to the position of affairs, but the Roman senate and people were impatient under it, and divided the command between Fabius and Minucius, his master of the horse. Minucius made a rash advance, was surrounded by the enemy, and would have been destroyed had he not been rescued by Fabius. Varro, one of the consuls who assumed the command after the expiration of Fabius's dictatorship, disregarded his counsels and suffered a severe defeat at Cannæ (216). After this Fabius suggested the measures of defence which were adopted by the senate. He was made consul for the fifth time in 209, and became *princeps senatus*. During this year he inflicted a severe blow upon the Carthaginians by the recapture of Tarentum. Toward the end of the war the more energetic plan of action proposed by Scipio prevailed over the advice of Fabius. He died at an advanced age in 203, when Hannibal was about leaving Italy. —Caius Fabius Pictor painted a battle piece for the temple of Salus which was dedicated in 302 B. C., the earliest Roman painting of which there is any record. It was preserved till the

time of the emperor Claudius, when the temple was destroyed by fire.—His son Numerius Fabius Pictor is mentioned by Cicero as an author of Greek annals, but was possibly mistaken for his nephew (a grandson of the painter), Quintus Fabius Pictor, the first prose writer of Rome, who served in the Gallic war, 225 B. C., and in the second Punic war. He was the author of a history of Rome from its foundation to his own time. Of this work, probably written in Greek, which was highly valued by later writers, no fragments remain.

FABRE, François Xavier Pascal, a French painter, born in Montpellier, April 1, 1766, died March 12, 1837. He was a pupil of David, and produced in 1787 a painting representing the "Execution of the Children of Zedekiah by order of Nebuchadnezzar," for which he received the great prize of the academy, and was sent as a pensionary to Rome. He was believed, though perhaps erroneously, to have been secretly married to the countess of Albany, who on her death in 1824 made him her sole heir, and bequeathed to him valuable MSS. which had been left to her by Alfieri. Fabre gave them to the city of Florence.

FABRE, Jean, surnamed "the honest criminal," a Protestant hero, born in Nîmes in 1727, died in Cette, May 31, 1797. He was a manufacturer and a member of the small Protestant community at Nîmes. He and his coreligionists celebrated the new year of 1756 in a secluded locality, where they were surprised by the soldiery, but he escaped. His father, however, having been arrested, Jean took his place as a prisoner in the gauleys of Toulon, and was subjected to great hardships. His release in 1762, and his full pardon in 1768, were mainly due to a play by Fenouillot de Falbaire, *L'honnête criminel*, of which he is the hero. His autobiography, completed by his son, was published with a biographical notice by Athanase Coquerel fils in the *Bulletin de la société de l'histoire du protestantisme français* (Paris, January to April, 1865).

FABRE D'ÉGLANTINE, Philippe François Nazaire, a French revolutionist and author, born in Languedoc, Dec. 28, 1755, guillotined in Paris, April 5, 1794. In gratitude for a wild rose (*églantine*) of gold awarded to him in early life at the floral games at Toulouse, he adopted that name. He wrote a variety of plays for the theatres of Paris, a few of which, as *Le Philinte de Molière*, *L'intrigue épistolaire*, &c., were favorably received. On the outbreak of the revolution he associated himself with Danton, whose secretary he became in 1792. He was a member of the convention, where he advocated the most violent measures, but played only a secondary part. He was accused of venality, and doomed to share the fate of Danton. While ascending the guillotine he distributed some of his writings among the populace. One of his comedies, *Les précepteurs*, was produced for the first time five years after his death, and received with great applause.

Two volumes of his writings were published in 1801 as *Œuvres posthumes et mêlées*.

FABRETTI, Raffaele, an Italian antiquary, born in Urbino in 1618, died in Rome in 1700. At the age of 18 he went to Rome, where he made himself profoundly acquainted with the literature and art of the ancients. After filling a diplomatic mission in Spain, he became treasurer of Pope Alexander VII., and under the three succeeding popes held various offices at Rome, Madrid, and Urbino. During his 18 years' residence in Spain he explored nearly all the antiquities of that kingdom. His first archaeological works, *De Aquæductibus Veteris Romæ* and *De Columna Trajani*, excited a general interest. His interpretation of certain passages of Livy involved him in a violent discussion with Gronovius. In a learned work upon ancient inscriptions he made known the treasures discovered by him in the catacombs of Rome. His rich collection of antiquities is still in the ducal palace of Urbino.

FABRIANO, a town of central Italy, in the province and 84 m. S. W. of the city of Ancona, at the foot of the Apennines; pop. about 6,000. It is the seat of a bishop, has a cathedral and several convents, and is celebrated chiefly for its paper and parchment. It is believed to be one of the first places at which paper from linen rags was manufactured. The town also contains tanneries and powder mills, and manufactures cloth and hats.

FABRIANO, Gentile da, an Italian painter of the Roman school, born at Fabriano about 1370, died in Rome in 1450. Michel Angelo said that his name Gentile, the noble or delicate, was in harmony with the character of his works. About 1418 he painted in the cathedral of Orvieto a Madonna, which still exists, and which was so much admired that the artist received the title of *magister magistrorum*. He then went to Venice, where he obtained great success, and was invited to Rome, where his paintings in the church of St. John Lateran, which his infirmities did not permit him to finish, made him esteemed the first painter of Italy. His manner resembles that of Fra Angelico.

FABRICIUS (Caius Fabricius Luscinus), a Roman statesman, celebrated for his virtue and integrity. While consul in 282 B. C. he defeated the Lucanians, Brutians, and Samnites, and enriched the public treasury with more than 400 talents from the spoils of the enemy, remaining poor himself. In 280 he served as legate in the campaign against Pyrrhus, king of Epirus, to whom he was sent at its close with an embassy, to ask the ransom or exchange of some Roman prisoners of war. The meeting of the envoy and the king at Tarentum has perhaps been embellished by the Roman historians. Fabricius is represented to have withstood not only the most splendid offers of Pyrrhus, who knowing his poverty tried to bribe him into his service, but also the threatening aspect of an elephant seemingly

let loose upon him. In reward of his integrity the king allowed the captives to go to Rome for the celebration of the Saturnalia, on promise of returning after the festival. In 279 Fabricius fought in the battle of Asculum, which, though nominally a victory for Pyrrhus, was regarded by him almost as a defeat. In the next year he commanded again as consul, and exposed to his enemy the treachery of his physician, who offered to poison him; upon which Pyrrhus is said to have exclaimed, "It is easier to turn the sun from its career than Fabricius from his honesty," and to have freed all his captives without ransom. When Pyrrhus evacuated Italy, Fabricius was engaged in subduing his allies. As censor in 275 he deprived P. Cornelius Rufinus of his seat in the senate, for having in his household 10 pounds of silver plate. Like Curius Dentatus, he spurned the presents of the Samnite ambassadors, and died so poor that the senate had to provide marriage portions for his daughters. He was buried within the walls of Rome, the prohibitory law of the twelve tables having been suspended in his honor.

FABRICIUS, Georg, a German scholar, born in Chemnitz, Saxony, April 24, 1516, died in Meissen, July 13, 1571. He was director of the college of Meissen. His edition of Horace (2 vols., Basel, 1555) is still esteemed. He wrote Latin poetry with great purity, and in his sacred poems he would employ no words which had the slightest flavor of paganism. Baumgarten-Crusius wrote a sketch of his life and writings (Meissen, 1839).

FABRICIUS, or **Fabrizio**, **Ciruelame**, surnamed from his birthplace **AB AQUAPENDENTE**, an Italian anatomist and surgeon, born at Acquapendente, in the Papal States, in 1537, died in Padua, May 21, 1619. A pupil of Fallopius, he succeeded him as professor of anatomy and surgery at the university of Padua, which position he held for 50 years. Fabricius was the first to demonstrate in 1574 the presence of valvular folds in all the veins of the extremities. William Harvey, who was his pupil, acknowledged himself indebted to his teachings for the discovery of the circulation of the blood. His writings comprise dissertations on the formation of the foetus, the structure of the oesophagus, stomach, and body, and the peculiarities of the eye, ear, and larynx; treatises on the egg and on veins, &c. Great honors were bestowed on him by the Venetian government, and a large anatomical theatre was constructed for his accommodation. The first edition of his surgical works appeared at Padua in 1617. An edition of his anatomical and physiological works was published by Bohn in Leipzig in 1687, followed in 1737 by the more complete one of Albinus of Leyden.

FABRICIUS, Johann Albert, a German bibliographer, born in Leipzig, Nov. 11, 1668, died in Hamburg, April 30, 1736. He studied philosophy, medicine, and theology, and in 1699 was appointed professor of rhetoric and moral

philosophy in the gymnasium of Hamburg. The extent of his learning in almost every department of knowledge, especially in philology, was remarkable. His most celebrated works are: *Bibliotheca Latina* (Hamburg, 1697; 5th ed., 3 vols., 1721; new ed. by Ernesti, 3 vols., Leipsic, 1773-4); *Bibliotheca Græca* (14 vols., Hamburg, 1705-28; continuation and new edition by Harless, 12 vols., Hamburg, 1790-1809, provided with an index in 1838); *Bibliographia Antiquaria* (Hamburg, 1713; new ed. by Schafelhausen, 1760); *Bibliotheca Ecclesiastica* (Hamburg, 1718); and *Bibliotheca Medica et Infima Ætatis* (5 vols., Hamburg, 1734; supplementary vol. by Schöttgen, 1746; new ed. by Mansi, Padua, 1754).

FABRICIUS, Johann Christian, a Danish entomologist, born in Tondern, Schleswig, Jan. 7, 1743, died in Kiel in 1807 or 1808. His academic studies were pursued at Copenhagen, Leyden, Edinburgh, and finally at Upsal, under Linnæus. He was much attached to the great Swede, and has preserved many interesting details of his private life. He adopted Linnæus's method, and introduced a system of classifying insects by the parts which constitute the mouth. He took the degree of doctor of medicine about 1767, and was afterward appointed professor of natural history in the university of Kiel, where he wrote his *Systema Entomologia* (1775), subsequently enlarged into *Entomologia Systematica* (4 vols. 8vo, Copenhagen, 1792-4). He employed the remainder of his life in developing and perfecting it, and for this purpose made tours over different parts of Europe. His *Genera Insectorum* (8vo, Kiel, 1777), *Philosophia Entomologica* (Hamburg, 1778), *Species Insectorum* (2 vols., 1781), *Mantissa Insectorum* (2 vols., Copenhagen, 1787), and other works show how complete and extended were his investigations in this branch of science. He also published essays on botany and natural history, accounts of travels in Norway, Russia, and England, and a variety of treatises, historical, political, and economical, relating to Denmark, the latter being prepared by him in his capacity of councillor of state and professor of rural and political economy at Kiel. He died of grief, it is supposed, occasioned by the bombardment of Copenhagen, and the political misfortunes of Denmark.

FABYAN, or **Fabian**, **Robert**, an ancient English chronicler, born in London about 1450, died in 1512. He was a merchant, became an alderman and sheriff of London, and wrote a general chronicle of English history, which he called the "Concordance of Histories," from the fabulous exploits of Brutus in Great Britain to the reign of Henry VII. It was first published after the author's death (folio, 1516), and reappeared in numerous editions, the last of which is that by Sir Henry Ellis, accompanied by notes and a learned introduction ("Chronicles of England and France," royal 4to, London, 1811). On account of its free animad-

versions on the Catholic clergy, Cardinal Wolsey is said to have caused the destruction of a portion of the first edition, perfect copies of which are now rare.

FACCIOLATO, or *Facciolati*, **Jacopo**, an Italian philologist, born in Torreglia, near Padua, Jan. 4, 1682, died Aug. 28, 1769. Cardinal Barbarigo sent him to the ecclesiastical seminary of Padua, where he took orders and rose to be professor of philosophy, and finally head of the institution. He afterward filled the chair of logic in the university of the same city, and was charged with continuing the history of that establishment which Papadopoli had begun. Besides several good editions of the classics and various works on grammar, ethics, theology, and some poetry, he published revisions of the *Lexicon* of Schrevelius, the *Thesaurus Ciceronianus* of Nizolius, and an edition in seven languages of Calepino's dictionary (2 vols. fol., 1731), in which he received much assistance from his pupil Forcellini and others. It was on the conclusion of the last named work that Facciolato and Forcellini began to compose the great Latin dictionary published after the death of both, under their joint names, but which was almost entirely the work of the latter. (See **FORCELLINI**.)

FACTOR (Lat., from *facere*, to do or make), one who conducts business for another. The word originally had almost the same meaning as agent (Lat. *agere*, to act). But while agent was used to represent every one who acted in any way in the stead of another, factor became limited to those who so act in mercantile transactions. Factor is then a mercantile agent, herein being like a broker; but the difference between them is principally this: a broker acts for his principal in reference to mercantile property which the principal retains in his hands; while the factor has possession of the goods sent to him for sale, or takes possession of those which he buys for his principal. From this difference others have grown; and the most important of these is, that the broker buys and sells as agent, while the factor may buy and sell in his own name, the person dealing with him not always knowing whether the factor or some one else owns the goods. In the United States, among merchants, the phrase commission merchant has taken the place of factor, and means much the same thing; but the word factor is retained as a law term, and the law of factors is the law of commission merchants. Besides regular commission merchants, any one intrusted with the possession of property belonging to another, and authorized by the owner to dispose of it, may be a factor, as a supercargo. So a common carrier may be a factor; and while he acts as such, he is responsible only as a factor, that is, only for injuries or losses caused by want of due care; but when he has sold goods as factor, and has received the money which it is his duty to bring home as carrier, his obligations as carrier revive, and he is now liable for any loss not

caused by the act of God or the public enemy. A factor is a general agent, and as such binds his principal.—The most general duty of a factor, as of every agent, is to obey the instructions he receives. But he is considered by the law merchant as an agent having much discretion, and an equal responsibility; while therefore he is bound to obey definite and positive instructions, he is not bound to pay such regard to mere intimations or wishes, because he may well believe that, whatever his principal might desire or consider expedient, if he did not give positive directions it was because he preferred leaving the decision to the discretion of his factor. And even if he have positive and precise instructions, his departure from them will be justified if it was caused by an unforeseen emergency, and if he acted in good faith, and certainly for the actual advantage of his principal. If, however, a factor buys goods for his principal and sends them to him in distinct violation of an order, his principal may reject the same, and may return them to his factor; or, if the nature of the goods and the circumstances of the case render it certainly expedient, he may sell the goods for his factor, and remit to him or credit him with the proceeds. A factor generally acquires no right to his commissions until the service by which he is to earn them is wholly rendered, unless prevented without his fault from completing his service, in which case he may have a reasonable compensation. Nor has he any claim for compensation unless he conducts his business with proper care and skill, and he is liable in damages for any loss his principal sustains by his want of care and skill; nor can he claim any compensation for any illegal or immoral service. A factor cannot delegate his power and right, except so far as he is authorized to do so, either expressly, or by the established usage, or by the peculiar circumstances of the case. In the absence of positive instructions, it is the duty of the factor to obey and conform to the common usage of that business, and he can, in general, bind his principal only within that usage. He has a considerable discretion, but is bound to use it with reasonable care, and with perfect good faith. Thus, if he hastens a sale improperly, and without reasonable cause or excuse, as, for example, if he hurries a sale, clearly against the interest of the principal, for the purpose of realizing at once his own advances, such a sale would be considered a fraudulent sacrifice of his principal's property, and would render him liable in damages. The factor is bound to insure the property of his principal when instructed to do so, and also if a general, well established, and well known usage requires it of him, and particularly if there have been antecedent acts or usages between him and his principal, from which his principal might reasonably have expected that he would effect insurance, and therefore omit doing this himself.—In general, the principal has the right of revoking the authority he has

given to his factor at any time before the factor has made any advances upon the goods; and may then demand them, paying of course whatever legal claims the factor may have, not for his commissions, but for expenses properly incurred about the goods, and for any special services he has been called upon to render. But it is a question whether, if a commission merchant has made advances upon goods, he has not now acquired an interest in them and an authority over them, which his principal cannot defeat by revocation. The prevailing doctrine in the United States is that a factor by advances upon goods acquires an interest in the goods themselves, and that his authority over them is therefore irrevocable. In England the courts hold otherwise, and a factor who has made advances upon goods is denied the power to sell them or any part of them if positively prohibited by his principal; while in the United States he may sell so much as will cover his advances and charges, the principal having power over only the surplus or residue after the factor's advances are repaid. The factor is not obliged to sell, but after demand and reasonable delay may have his action against his principal for his advances.—The question what power a factor has to pledge the goods consigned to him has been much agitated. By placing the goods in his possession, the principal may be said to give to his factor the power of acting as an owner, to the injury of others. It is on this ground that in England and in many of the United States such a factor, whether called commission merchant, consignee, agent, or otherwise, is deemed to be the true owner, so far as to render valid a sale, pledge, or other disposition of the property, while the party with whom he deals acts in good faith. A factor may make a special contract with his principal, to guarantee all sales made for him. In continental Europe, sometimes in England, more rarely here, such a factor is said to act under a *del credere* commission. With us he is commonly, and perhaps universally, said to act under a guarantee commission. The meaning of this is, that in addition to the usual commission (or that agreed upon) for the sale of the goods, he receives a further commission, in consideration of which he guarantees the payment by the purchaser of the price of the goods, and agrees to pay if the purchaser does not. A guarantee commission merchant has the same claim on his principal for his advances as if he made no guarantee. If he takes a note from the purchaser of the goods, this note is the property of his principal, and he guarantees the note; and if he takes payment in depreciated paper, he must make it good. If money be paid, and he remits it in some customary and proper way, or in such way as may be specially directed by the owner, he is not responsible for its safe arrival, unless he undertakes to guarantee the remittance; in which case he may charge a commission for his guaran-

tee. Without any guarantee commission a factor is liable to his principal, not only for his neglect or default, but for certain acts which seem to assume this liability; as if he sells the goods of several principals to one purchaser, on credit, and takes a note payable or indorsed to himself, and gets it discounted.—It has already been remarked that a factor may buy, sell, sue and be sued, demand, collect, receive, and receipt for money, all in his own name, and as a principal, while a broker can do all this only in his own name and as an agent. This difference between them springs from the possession of the goods by the factor (for possession is one of the principal *indicia* of ownership) and the non-possession of them by the broker. There is a more important difference between them, founded on the same circumstance; this is, that the factor has a lien on the goods for his advances, charges, and commissions, and a broker has not. But if a factor voluntarily transfers the goods to the owner, or to the owner's order, he cannot reclaim them as his security, but retains only his personal right to demand his advances and charges from the owner. If the owner is insolvent, the factor takes then only his dividend; whereas if he still holds the possession, the other creditors can have the goods only by discharging the factor's claims in full. Therefore the factor and his principal may have claims against a purchaser which may seem to conflict; for the principal may demand his price, while the factor claims his advances and charges. In general, it may be said that if a purchaser pays in good faith to either, without notice of the other's claim, he will be protected against the other. But if the owner demands his price, the purchaser cannot set off against this, or claim to deduct, a general debt to the purchaser from the factor, unless the factor sold the goods as his own, under circumstances which gave him a right so to sell them, and the buyer believed they were his own; in which case the buyer may charge against the price, or indeed pay the whole price, by the indebtedness of the factor to him. On the other hand, if the factor has a lien on the goods, and has not lost his lien by parting with the possession of the goods, the buyer cannot set off against this lien any debt due to him from the principal, although the principal be named at the sale as the owner of the goods.—An important distinction is made between a foreign factor, or one who transacts business for his principal in a country in which the latter does not reside, and a domestic factor, or one who acts in the same country in which the principal resides. Although every factor may act in his own name, yet in the case of a foreign factor the law goes much further, and considers the factor as in almost all respects a principal. The reason of this is obvious. A person dealing at home with a factor whose principal resides abroad, has no means of knowing who the principal is, or what goods are his, or by what title they

are his, or for what purpose they are in the factor's hands, excepting as the factor may choose to tell him. He can have no access, or certainly no easy access, to the foreign principal, for the purpose of remedy or enforcement; and, on the other hand, cannot be presumed to have bought or sold on the credit of a person thus unknown and inaccessible. It is but fair, therefore, that the factor should be, as to the purchaser, the principal; and it is equally fair that the factor should be in such case the only principal. These, however, are but presumptions of law. The factor and purchaser may make what agreement they please, and the law will carry it into effect. In the absence of special agreement, that is, in the case of an ordinary transaction with a foreign factor, the buyer may sue the factor, and cannot sue the principal, although the principal may recover from a buyer a price not yet paid to the factor. The rule that the party dealing with the factor looks to him only, seems to be well settled, if he knew that he was dealing with the factor of a foreign principal, and reserved no right or claim against that principal. Whether he could sue the principal, if he did not know him at the time of the transaction, but discovered him afterward, is not so certain; for there are authorities which limit the rule to the former cases, and in the latter give the party a concurrent remedy against the factor and the principal. It seems now settled that, for the purpose of this distinction, the states of the Union are foreign to each other. It is a general rule that a principal does not lose his property by any wrongful act of his factor, as long as he can trace and identify his goods, either in the factor's hands, or into the hands of any person who holds by representation of or derivation from the factor, without being purchaser, pledgee, or otherwise a transferee in good faith and for value. And when a principal finds his property encumbered by an act of the factor, as a pledge, or the like, he may always recover his property by paying the amount of encumbrance. In some of the United States a fraudulent disposition by a factor of the property of his principal is an indictable offence, and is punished with severity.

FACUNDUS, a Latin theologian of the 6th century, bishop of Hermia in Byzacium, Africa. With many other bishops, especially those of Africa, he opposed Justinian's decree condemning the "three chapters" (see **CONSTANTINOPLE, COUNCILS OF**), and wrote at Constantinople *Pro Defensione trium Capitulorum Libri XII*. He attended the conference of bishops called by Pope Vigilius there in 547, refused to commune with him for his vacillating course, and after the council of Constantinople (553) was banished. The above work (edited by Sirmond, 1629) and other writings of Facundus were several times printed in the 17th and 18th centuries.

FAED, John and Thomas. See supplement.

FAENZA (anc. *Faentina*), a fortified city of central Italy, in the province and 18 m. S. W. of the city of Ravenna, on the Lamone, at its junction with the canal of Zanelli; pop. in 1871, 36,290. It is the seat of a bishopric, and has a fine cathedral, theatre, several churches and convents which contain valuable paintings, a lunatic asylum, a city hall, several splendid private palaces, a royal lyceum with a picture gallery, a communal gymnasium, and a technical school. The beauty of the city and its suburbs has gained for it the name of the Florence of Romagna. Its formerly celebrated manufactures of a peculiar earthenware, called from this place *faience*, have declined in importance, and its chief industry at present consists in manufactures of paper, linen, and silk, and in an active commerce in the products of the territory, which are taken by canal from Faenza to the Po. A few miles from the town are ferruginous and saline springs and baths, which are much resorted to.—This city was the scene of the defeat of Carbo and Norbanus by Metellus, 82 B. C. It was taken by the Goths in the 6th century, and by the emperor Frederick II. in 1241. Sir John Hawkwood, in the service of Gregory XI., captured it in 1376, and put to death, it is said, about 4,000 persons. It was successively subject to Bologna and Venice, and in 1509 was taken by Pope Julius II.

FÆSULÆ. See **FIEBOLÆ**.

FAGNANI, Joseph, an American artist, born in Naples, Italy, Dec. 24, 1819, died in New York, May 22, 1878. He made crayon portraits before completing his 13th year, left the royal academy at 18, and removed to Vienna, where he painted a portrait of the archduke Charles. In 1842 in Paris he met Maria Christina of Spain, who invited him to Madrid. There he secured the friendship of Sir Henry Bulwer, and accompanied him to Washington in 1849. In 1851 he removed to New York, and married an American lady. From 1858 till 1865 he was in Europe, and executed portraits of Garibaldi, Victor Emanuel, the empress Eugénie, Abdul Aziz, Ali Pasha, Cialdini, Rattazzi, and others. After his return to New York he painted a series of pictures called the "Nine Muses." Among his other works are portraits of Queens Christina and Isabella of Spain, the duchess of Alba, the duke d'Aumale, the countess Guiccioli, Lord Byron from a miniature, Sir Robert Peel, Alexis de Tocqueville, John Bright, Richard Cobden, Daniel Webster, Henry Clay, Gen. Taylor, and Gen. Sheridan. He received the only gold medal ever given for a portrait by the royal Bourbonic academy of Naples, and was decorated by a number of European sovereigns.

FAHLCRANTZ, Karl Johan, a Swedish painter, born in Dalecarlia, Nov. 29, 1774, died Jan. 1, 1861. He was the son of a clergyman, and, although self-taught, his delineations of Scandinavian scenery won for him the reputation of the best Swedish landscape painter of his day. His most finished paintings belong to the Swe-

dish royal family, and a number of them were purchased by Frederick VI. of Denmark.

FAHLUN, or *Falan* (Sw. *Fäklü*), the capital of the Swedish län of the same name or Kopparberg, on the W. shore of Lake Runn, 130 m. N. N. W. of Stockholm; pop. in 1868, 5,891. The houses are low and almost entirely of wood. The copper mines W. of this town are among the oldest and most celebrated in Europe. They produced in former times upward of 3,000 tons, but now about 700 tons annually. The external opening, made by the falling in of ancient galleries, is about 300 ft. deep, and 1,200 ft. long by 600 wide. The descent to the bottom of this is by easy stairs, whence steep ladders lead to the pits, the lowest of which are about 1,300 ft. from the surface. The excavations extend many miles under ground, forming several magnificent chambers, where banquets were given to Bernadotte and his queen, and Prince Oscar, on which occasions the mines were brilliantly illuminated. The mines are owned by a company of 1,200 shares, which has the monopoly of iron and other works in the vicinity. Besides copper, small quantities of gold, silver, and lead are obtained from the ore. Connected with the mines are a school of practical mining, a model room, a large scientific library, and a geological museum. (For the län see KOPPARBERG.)

FAHRENHEIT, *Gabriel Daniel*, a German physicist and mechanic, born in Dantzic about 1690, died in Amsterdam, Sept. 16, 1736. His predilection for the natural sciences led him to abandon mercantile life and travel in pursuit of knowledge. After visiting various parts of Germany, France, and England, he settled at Amsterdam as a maker of philosophical instruments. Here some of the most eminent natural philosophers of the day became his friends and instructors. Fahrenheit improved the areometer, and made some progress with the design of a hydraulic machine for the draining of marshes, which he left unfinished; but he is chiefly distinguished for the changes which he made in the thermometer, which were first carried out in 1720, and have added much to the accuracy and value of that instrument. (See **THERMOMETER**.) His thermometer since its first introduction has been in general use in Holland, Great Britain, and the United States. Its constructor was elected a member of the royal society of London in 1724, in whose "Philosophical Transactions" for that year are papers by him.

FAIDHERBE, *Louis Léon César*, a French soldier, born in Lille, June 3, 1818. He studied at Paris and Metz, served in Algeria and Guadeloupe, and became in 1854 governor of Senegal, where he distinguished himself and considerably extended the French possessions. After a brief command in Algeria he was sent again to Senegambia, and remained there as governor till 1865, when he became commander of the military division of Bona in

of Amiens by the Germans, at the end of November, 1870, he was appointed by Gambetta commander-in-chief of the northern army and of the third military division. With about 50,000 men he took the offensive near Amiens, and after various unfortunate engagements was thoroughly defeated at Bapaume, Jan. 3, 1871, Péronne capitulating Jan. 10, after three weeks' resistance; and he was overwhelmed at St. Quentin, Jan. 19. His forces were completely disorganized and retreated toward Lille, and the northern army was disbanded in March. In June he was elected by Lille to the national assembly, and in 1872 he resigned his commission in the army. He has written *Chapitre de géographie sur le nord-ouest de l'Afrique* (1864); *Collection complète des inscriptions numidiques* (1870); and *Campagne de l'armée du nord* (1871, several times reprinted).

FAILLON, *Michel Étienne*, a French theological and historical writer, born at Tarascon in 1799, died in Paris, Oct. 25, 1870. He was a Sulpician of Paris, and came to Montreal in 1854 as visitor of the houses of that congregation in America. His contributions to the history of Canada are numerous and valuable, embracing a life of the Ven. Mr. Olier (1853); of Margaret Bourgeoys, foundress of the congregation sisters (1852); of Mlle. Maure, foundress of the Hôtel Dieu (1854); of Madame d'Youville, foundress of the gray sisters (1852); of Mlle. le Ber, the recluse (1860); and a very extended history of the French colony in Canada, of which 8 vols. 4to (1865-'6) appeared before his death, embracing only a small portion of his plan.

FAILLY, *Pierre Louis Charles Achille de*, a French soldier, born at Rozoy-sur-Serre, department of Aisne, about 1810. He went to Algeria as sub-lieutenant in 1828, was afterward orderly officer of King Louis Philippe and director of the military school at Toulouse, became brigadier general in 1852, and for his services in the Crimean war was made general of division, Sept. 22, 1855. He was aide-de-camp of Napoleon III., commanded a division in the war of 1859, and especially distinguished himself at Solferino. In 1867 he was sent with an expeditionary corps to Rome. On the outbreak of the Franco-German war in 1870 he was placed in command of the fifth corps, with his headquarters at Bitsch. After the disastrous battle of Wörth he retired with the remnant of MacMahon's army to Châlons. Coöperating with the forces of the latter during their passage of the Ardennes for the relief of Bazaine at Metz, he was surprised and defeated at Beaumont, Aug. 30. MacMahon was paralyzed, and the capitulation of Sedan terminated the career of Faily. While a prisoner of war he attempted in his *Marches et opérations du 5^m corps* (Brussels, 1871) to refute the charges brought against him.

FAIRE (Lat. *feria*, a day of rest, a holiday), a gathering for the purchase and sale of goods,

or the hiring of servants, occasionally associated with religious festivals and popular entertainments. The ancient Greeks held fairs in conjunction with popular assemblies for political purposes. The Roman fora, though properly permanent market places, attracted great multitudes at times of festivity and important judicial and political gatherings, and on such occasions the special facilities for selling goods, as well as the special provisions for popular entertainment, must have given them somewhat of the character of fairs. In the 5th century fairs were established in several French and Italian cities. The fair of St. Denis was instituted by Dagobert in 629, and the fair of St. Lazare by Louis VI. Aix-la-Chapelle and Troyes trace their fairs to about the year 800. Alfred the Great introduced them into England in 886, and in 960 they were established in Flanders. Fairs for the sale of slaves were common throughout Germany and the north of Europe about the year 1000; and in 1071 they were encouraged in England by William the Conqueror. Slaves were sold also at St. Denis, and French children were taken in return to be bartered away in foreign countries; this trade was prohibited through the efforts of Bathilda, a wealthy freedwoman. These institutions were of great value during the middle ages, and especially serviceable in rude and inland countries. The number of shops and the objects offered for sale in them were very limited, and consequently little frequented by dealers. These fairs had numerous privileges annexed to them, and they afforded special facilities for the disposal of goods. While commerce was burdened with every possible kind of taxes and tolls, and travel was not only difficult but frequently unsafe, the fairs had generally the advantage of being free from imposts, and the merchants who wished to be present at them enjoyed the protection of the government for their goods and persons. Many fairs were associated with religious festivals, perhaps to insure a large concourse of people. In many places they are still held on the same day with the vigil or feast of the saint to whom the principal church of the town is dedicated. It was even customary in England and Germany to hold the fairs in the churches and churchyards. Fairs for cattle, agricultural products, and staple manufactures have been found entirely unnecessary in countries enjoying a free and flourishing trade, and they dwindle accordingly into insignificance. On the other hand, fairs offer special opportunities for comparing different qualities of home manufactures and produce, and thus are valuable as a means of instruction. Another advantage attached to them is that they bring communities which are but slowly reached by the progress of civilization into regular contact with it. The most celebrated fairs of large cities in former times accordingly manifest the greatest decrease of attendance, while the genuine country fairs still retain much of their importance.—To the priory of

St. Bartholomew in London, founded early in the 12th century, Henry I. granted in 1133 the privilege of holding a fair on St. Bartholomew's day. The original grant was for three days, but it was gradually extended to fifteen. An order of the common council in 1708 limited its duration again to three days. It was at first a great place of resort for traders and pleasure seekers, but it declined in importance until it was only attended by itinerant showmen and the owners of a few stalls. In 1850 the lord mayor made proclamation of the fair for the last time, and it has not been held since 1855. (See Morley's "Memoirs of Bartholomew's Fair," London, 1859.) Weyhill fair in Hampshire (Oct. 10) has probably the greatest display of sheep of any fair in Great Britain. St. Faith's, near Norwich (Oct. 17), is the principal English fair for Scotch cattle, but large numbers are also disposed of at Market Harborough, Carlisle, and Ormskirk. Ipswich has two considerable fairs, one in August for lambs, of which about 100,000 are sold, and one in September for butter and cheese. The August fair of Horncastle, Lincolnshire, is the largest horse fair, and is resorted to by dealers not only from Great Britain, but also from the continent and the United States. Howden in Yorkshire has also a large horse fair, particularly for Yorkshire hunters. Suffolk horses are exhibited at the celebrated Woodbridge Lady-day fair. Bristol, Exeter, and many other English cities, towns, and hamlets, have their fairs. A great cheese fair is held in April at Gloucester. Fairs were held at Greenwich at Easter and Whitsuntide, which attracted large crowds of visitors from London to partake in the many amusements, as well as to enjoy the fresh air and the fine scenery from the park and its neighborhood; but Greenwich fair was suppressed in 1857 by the police, the inhabitants having complained of it as a nuisance. Walworth, Camberwell, and Peckham fairs have also been suppressed. The most important mart in Scotland for cattle and sheep is Falkirk fair or tryst. The largest fair in Ireland for the sale of cattle and sheep is held from Oct. 5 to 9 at Ballinasloe, in the counties of Galway and Roscommon. About 25,000 head of cattle and 75,000 sheep, most of which are raised in Connaught, are annually brought to this fair. Donnybrook fair, celebrated for its noisy mirth and pugnacity, is now abolished.—In France the St. Denis fair, near Paris, both commercial and religious, was continued till 1789. It was customary to exhibit there a piece of wood alleged to have belonged to the cross on which Jesus was crucified, and the whole of Paris went to see it. The St. Lazare, St. Laurent, St. Germain, and St. Ovid fairs in Paris were also suppressed in 1789. Permanent markets have taken their place as far as the sale of goods is concerned, and the popular shows and entertainments that used to attend them are now confined to the celebration of national holidays and church festivals. In

the departments a few fairs are still in existence and enjoy a good trade. The most important is the fair of Beaucaire, which is held July 22-28, and rivals the great fairs of Germany and Russia. The counts of Toulouse granted this fair some privileges in the 13th century, and Charles VIII. decreed its time and duration. In the very heart of the town an extensive square is appropriated for it, and while it lasts thousands of stalls are erected on it, in which is offered for sale everything that forms an article of commerce. It is believed that often as many as 200,000 traders from all parts of the world assemble here. After dark the whole town is given up to gayety, and the numerous show and concert and dancing saloons turn it into a pandemonium. A tribunal of commerce, consisting of 12 members, exercises during this season absolute judicial power over all mercantile differences. It is estimated that the trade of the week of the fair amounts to \$4,000,000 or \$5,000,000. Equally large are the transactions made at the fair of Guibray, a small suburb of the town of Falaise, held from Aug. 10 to 15. It was instituted in the 11th century by the dukes of Normandy, and is the principal market for wool and woollen goods, and for valuable horses.—The annual fairs in Amsterdam, Rotterdam, and other cities in Holland, are scenes of great popular rejoicings. For several days and nights the streets are paraded by joyous crowds, and the usual sobriety of the Dutch yields to boisterous demonstrations. Theatres and shows of all kinds form the staple amusements, and among the refreshments are wafer cakes, a sort of thin cake baked in an iron mould, of which the consumption is enormous.—The principal fair of Italy is that of St. Mary Magdalen in Sinigaglia, which is annually held in July and August, and attended by traders from all parts of central and northern Europe, north Africa, and the Levant. Among the various products of Italian industry which change hands here, silk is the most important. Fairs of less consequence are held in other parts of Italy, as well as in Spain and Portugal. The most famous fair of Madrid is annually held on May 15, at the hermitage of San Isidro del Campo, when the grand pilgrimage and festival of San Isidro draws thither crowds of the population. The great Hungarian fairs are held chiefly at Pesth. Four times a year, in March, May, August, and November, the industrial products of Hungary are brought here for sale. Scarcely less important for the commerce of eastern Europe, and more interesting for the traveller and observer of national customs, are the fairs of Debreczin.—The fairs of the greatest European importance, however, are those of Germany. They originated there, as in many other countries, through religious festivals. Hence fairs were called *Kirchmessen*, church fairs, the German word *Messe* (fair) being derived from mass. The most prominent fairs are those of

the-Oder, and Brunswick. The Leipsic fairs date from the 12th century, and are the most frequented. Of the aggregate value of goods sold at German fairs Leipsic has 46 per cent., Frankfort-on-the-Oder 86, Frankfort-on-the-Main 15, and Brunswick 5. Leipsic holds three fairs: the Easter fair, beginning on the second Sunday after Easter, the Michaelmas fair, beginning with the week of Michaelmas; and the New Year's fair, beginning on Dec. 27. The Easter fair is the most important, and the New Year's fair the least. The imports of goods in 1870 for New Year's amounted to 187,930 cwt.; for Easter to 813,300 cwt.; for Michaelmas to 296,870 cwt.; total, 798,100 cwt. The principal articles of trade carried to the fairs are furs, yarn, silk, cloth, cotton goods, ribbons, hardware, toys, china, glass, and earthenware, drugs, grain, hides, leather, dye stuffs, colors, oils, alcohol, coal, and paper. Easter is the customary season among booksellers for settling their accounts, and for the principal trade sale, but the exhibition of books formerly connected with this fair has gone into disuse.—The most celebrated fairs of Russia are held in Nizhni-Novgorod. The January fair is specially for timber and articles in wood, and takes place on the frozen river; the July fair is devoted to the sale of horses; but the Peter Paul fair, beginning Aug. 5 and lasting until the end of September, embraces every known product of Asia and Europe, and exceeds in magnitude all other fairs in the world. The traders present during this season often number 200,000, and comprise representatives of every race and nation. The principal articles of trade are tea, grain, cotton, wool, horse and camel hair, hides, iron, copper, jewels, and furs; but every kind of manufacturing and agricultural produce is brought to this market. The sales amount to nearly \$100,000,000. The Russian government erected a bazaar for storing furs, shawls, and tea, and drew from each fair a rent of \$200,000. This enormous building was destroyed by fire in 1864. The fair of Kiakhta on the Russian-Chinese frontier, held every December since 1727, and formerly of great magnitude, as it was the only legal trading post between the two countries, has dwindled to comparative insignificance since the opening for traffic in 1860 of the whole frontier, and the decree of 1861 permitting the importation of tea from the countries W. of Russia, and the ports on the Baltic sea.—The chief fairs of Turkey are those of Yenidje Vardar and Sere, the former commencing on Dec. 8 and continuing for about three weeks, and the latter on March 21, for three or four weeks; of Okhrida (May 3), Varna (May 28), Filibe (Aug. 27), and Eski Saghra (Nov. 10), each of which lasts a fortnight; and those of Yatar Bazari (Sept. 15) and Tchaltadeh (Nov. 6), which last 10 days. Conspicuous among the various traders assembled there are the Greeks and Armenians. But the greatest fair in the East is held at Mecca during the

time of the annual pilgrimages. Although it has declined from its ancient magnitude, the average concourse still amounts to 100,000.—The largest fair in India is held at the vernal equinox at Hurdwar, on the upper Ganges. It is the season of the yearly pilgrimage, and from 200,000 to 300,000 strangers are then assembled in the town; every 12th year, which is accounted peculiarly holy, nearly 2,000,000 pilgrims and dealers visit the place. This fair is supplied with every article of home produce, and not only elephants but tigers and other wild beasts are offered for sale. Previous to the British occupation, the fairs usually ended in bloodshed; but owing to the precautions adopted, perfect order is now preserved.—According to Prescott's "History of the Conquest of Mexico," fairs were held in the principal cities of ancient Mexico every fifth day (there having been no shops), and were thronged. "A particular quarter was allotted to each kind of article. The transactions were conducted under the inspection of magistrates appointed for the purpose. The traffic was carried on partly by barter, and partly by means of a regulated currency of different values. This consisted of transparent quills of gold dust; of bits of tin, cut in the form of a **T**; and of bags of cacao, containing a specific number of grains." Fairs were regularly held at Azcapotzalco, not far from the capital, for the sale of slaves. The gatherings in the market of Tlascala were a sort of fairs, where pottery which was considered equal to the best in Europe formed one of the principal articles of trade, and every description of domestic produce and manufacture was brought there for sale. But the greatest fair was held in the city of Mexico. The visitors there were estimated at from 40,000 to 50,000, but the most perfect order reigned throughout. A court of 12 judges sat in one part of the *tianguiz*, clothed with absolute power, which they exercised with great rigor. In Prescott's "History of the Conquest of Peru" it is said that the incas instituted fairs for the facilitation of agricultural exchanges. They took place three times a month in some of the most populous places, where, as money was unknown, a rude kind of commerce was carried on by barter.—The only fairs in the United States, properly so called, are assemblages for the sale and purchase of goods, generally contributed gratuitously, for the benefit of some particular object, as the building or furnishing of a church, or the promotion of some charitable enterprise. During the civil war very large sums were raised by the so-called sanitary fairs, for the benefit of the sick and wounded.—The word fair is also applied to exhibitions of articles not specially intended for sale, and sometimes strictly prohibited from sale at the place of exhibition. The state and county fairs in the United States are for competitive exhibition rather than general traffic. (See **INDUSTRIAL EXHIBITIONS**.)

FAIRBAIRN, Sir **WILLIAM**, a British civil engineer and machinist, born in Kelso, Feb. 19, 1789, died in Manchester, Aug. 18, 1874. He learned engineering at a colliery in Newcastle, where he remained seven years. In 1817 he began business in Manchester as a machine maker, and for upward of 20 years his firm was the most important of the kind in that town. Among the improvements he introduced may be mentioned simpler contrivances for driving the machinery of factories, modifications in the valves of steam engines, the double-flued boiler, the use of ventilated buckets in water wheels, and the invention of the riveting machine. In 1830-'31, his attention having been drawn to the advantages of iron as a material for building ships, he constructed a small iron vessel, which was successfully launched, and was one of the first of its class in England. He afterward constructed at Millwall many large vessels of the same material. He was also one of the first to attempt buildings of iron. His experience in the iron manufacture caused him to be consulted with regard to the construction of the tubular bridge over the Menai strait; and in connection with Mr. Hodgkinson he engaged in a number of experiments, the result of which has been to introduce into general use wrought-iron plate girders in ordinary building operations, as well as in railway engineering. He delivered lectures in 1858 on the "Resistance of Tubes to Collapse," on the "Floating Corn Mill for the Navy," on the "Progress of Mechanical Science," &c. He published "Cast and Wrought Iron for Building Purposes" (London, 1852; New York, 1854); "Useful Information for Engineers" (1856); "Iron, its History and Manufacture" (Edinburgh, 1863); "Mills and Mill Work" (2 vols., London, 1864-'5); and "Iron Ship Building" (1865). He was made a baronet in 1869.—See Smiles's "Lives of Engineers."

FAIRFAX, a N. E. county of Virginia, separated from Maryland and the District of Columbia by the Potomac river; area, 430 sq. m.; pop. in 1870, 12,952, of whom 4,284 were colored. The Occoquan river touches it or the S. W. The Orange, Alexandria, and Manassas, and the Washington and Ohio railroads pass through it. On the bank of the Potomac, in this county, and 15 m. below Washington city, stands Mount Vernon, the residence of George Washington. The surface is generally hilly. The soil in some places is sandy, and in others is nearly worn out; but there are many fertile and well cultivated districts. The chief productions in 1870 were 59,982 bushels of wheat, 295,380 of Indian corn, 120,072 of oats, 71,227 of potatoes, 8,097 tons of hay, and 178,345 lbs. of butter. There were 2,811 horses, 8,907 milch cows, 8,825 other cattle, 2,414 sheep, and 7,152 swine; 4 flour and 6 saw mills, 12 manufactories of carriages and wagons, and 2 of bricks. Capital, Fairfax Court House.

FAIRFAX, Edward, an English poet, born at Denton, Yorkshire, died in the parish of Faystone about 1638. The translation of Tasso's "Jerusalem Delivered," by which alone his name is remembered, was made in his youth, and dedicated to Queen Elizabeth, and was long enthusiastically admired. The first edition was dated 1600. Its popularity has revived in the present century, and several editions have appeared in England and the United States. The last American edition was in 1855. He also wrote a few eclogues, a prose work on demonology, and a "History of Edward the Black Prince," the manuscript of which was destroyed by fire at Whitehall.

FAIRFAX, Thomas, third Baron Fairfax of Cameron, in the Scottish peerage, grand-nephew of the preceding, a parliamentary general in the civil wars of Charles I., born at Denton, Yorkshire, in January, 1611, died at Bilburgh, near York, Nov. 12, 1671. He studied at St. John's college, Cambridge, served as a volunteer in Holland, under the command of Lord Vere, whose daughter he afterward married, returned to England in 1634 or 1635, and lived in retirement till the breaking out of the war in 1642. When the king set about raising a guard for his person at York, Fairfax presented himself at the head of a multitude of 100,000, praying that he would return and hearken to his parliament. The first hostilities occurring in Yorkshire, Fairfax's father, Ferdinando, second Lord Fairfax, was made general of the parliamentary forces in the north, with himself (then Sir Thomas Fairfax) as his general of the horse. They were denounced as traitors by the earl of Newcastle, the royal commander in those parts, who in turn was proclaimed a traitor by the parliament. The Fairfaxes were defeated in several encounters, and completely routed in an attack upon the royalist forces under the earl of Newcastle at Atherton Moor. The first parliamentary success of 1644 was that of Nantwich, in Cheshire, where Sir Thomas Fairfax defeated Byron with great loss, and Monk, the future restorer of the monarchy, was taken prisoner. Fairfax then joined the Scotch army, which to the number of 20,000, under the command of Lord Leven, had crossed the Tyne, and united with the earl of Manchester's army, in which Cromwell was major general. At Marston Moor, near York, on July 2, Fairfax gained a temporary success; but the victory was decided only by the steady valor of the republicans under Cromwell. York was immediately forced to surrender, and Sir Thomas quickly reduced the remaining royalist fortresses north of the Trent, and after the passage of the self-denying ordinance in 1645 received from parliament the appointment of commander-in-chief. On April 3 he departed for Windsor, where with the assistance of Cromwell, who was his lieutenant, he set about remodelling the army. On June 14 the hostile forces met at Naseby, where Fairfax and Cromwell pierced the royalist ranks in all

directions. The personal valor of Fairfax was especially signalized in this battle. He was constantly in the thickest of the fight, and rode about bareheaded after his helmet was beaten to pieces. He now quickly recovered Leicester, Langport, Bridgewater, and Bath. Bristol soon surrendered, and the speedy reduction of the kingdom followed, Fairfax and Cromwell having to this end divided their forces. In the politics of the dominant party Fairfax had now to play the difficult part of a sincere advocate of monarchical power. He seems to have been led on by Cromwell, and to have been the instrument of projects whose depth he could not fathom. In 1648 he annihilated the last remains of the royalist party at Colchester. His own influence declined as that of Cromwell and the Independents increased; and though his loyal instincts recoiled from the judicial trial of the king, he was unable to prevent it. He accepted the command of all the forces of England and Ireland under the new government, put down the Levellers in Oxfordshire, and composed the troubles in Hampshire. When in 1650 the Scots declared for Charles II., he refused to march against them, and laid down his commission. When Monk entered England, Fairfax took possession of York, Jan. 1, 1660. He gave his consent to the restoration of the monarchy, and presented to King Charles the horse on which he rode to his coronation, after which he went into retirement. Lord Fairfax was a friend of learning, and in his youth devoted much attention to antiquarian studies. During the siege of York, when a tower containing many ancient documents was blown up, he rewarded the soldiers for bringing him as many as could be found, and employed Roger Dodsworth to copy them; they now make a part of the *Monasticon Anglicanum*. When he took possession of Oxford, June 24, 1646, he set a guard over the Bodleian library, which otherwise might have been destroyed. He wrote a narrative of his career from the commencement of the war, not intended for the public eye, but which was published in 1699 under the title of "Short Memorials of Thomas, Lord Fairfax."—See "The Fairfax Correspondence," edited from the family manuscripts by Robert Bell (4 vols., London, 1849); and "Life of the Great Lord Fairfax," by C. R. Markham (1870).

FAIRFAX, Thomas, sixth Baron Fairfax of Cameron, a British nobleman, born about 1690, died at Greenway Court, near Winchester, Va., in 1782. He was educated at Oxford, enjoyed a reputation as a wit and man of letters, and contributed some papers to the "Spectator." He visited Virginia in 1739 to look after the large estates he had inherited from his mother, the daughter of Lord Culpeper, governor of the province between 1680 and 1683. They comprised upward of 5,700,000 acres lying between the Potomac and Rappahannock rivers, on both sides of the

Blue Ridge, including a great portion of the Shenandoah valley. He resided afterward at Belvoir, near Mount Vernon, on the Potomac. In 1748 he made the acquaintance of George Washington, then a youth of 16, and, impressed with his energy and talents, employed him to survey his lands lying west of the Blue Ridge. This was the commencement of an intimacy between Fairfax and Washington, which survived all differences of opinion on political subjects, and terminated only with the death of the former. So favorable was the report of Washington, that his employer soon after took up his residence at Greenway Court, in the midst of a manor of 10,000 acres, about 12 miles from Winchester, where during the remainder of his life he lived in a state of baronial hospitality. During the panic on the Virginian frontier after the defeat of Braddock, Fairfax organized a troop of horse, and, as lord lieutenant of Frederick county, called out the local militia. During the revolutionary war he adhered to the royal cause. The surrender at Yorktown deeply wounded his national pride, and, according to tradition, was the immediate cause of his death, which happened soon after. The generosity of Lord Fairfax is exemplified in the surrender of his large estates in England to his brother, and in his frequent gifts of lands to his poor neighbors in Virginia.—The title is still vested in his descendants, the present and 11th baron (1874) being John Coutée Fairfax, M. D., of Bladensburg, Md.

FAIRFIELD. I. A S. W. county of Connecticut, bordering on Long Island sound and the state of New York, and bounded N. E. by the Housatonic river; area, 647 sq. m.; pop. in 1870, 95,276. It has excellent harbors all along the coast, and contains several important commercial ports. The Housatonic is navigable by steamboats, and supplies valuable water power. The surface of the county is considerably diversified, and the soil is good. It is traversed by numerous railroads connecting with New York, New Haven, Albany, &c. The chief productions in 1870 were 13,312 bushels of wheat, 46,457 of rye, 285,683 of Indian corn, 172,482 of oats, 515,128 of potatoes, 78,950 tons of hay, 880,261 lbs. of butter, and 190,047 of tobacco. There were 5,652 horses, 14,214 milch cows, 15,263 other cattle, 6,082 sheep, and 8,200 swine. There were 754 manufacturing establishments, with an aggregate capital of \$12,145,097. The most important were 2 of ammunition, 12 of boots and shoes, 7 of buttons, 24 of carriages and wagons, 32 of clothing, 3 of cotton goods, 3 of drugs and chemicals, 1 of small arms, 7 of furniture, 4 of gas, 14 of hardware, 6 of hat materials, 27 of hats and caps, 1 of rubber goods, 2 of patent and enamelled leather, 4 of engines and boilers, 5 of tombstones, 18 of saddlery and harness, 7 of sashes, doors, and blinds, 1 of sewing-machine fixtures, 3 of sewing machines, 1 of steel, 3 of steel springs, 1 of straw goods,

23 of tin, copper, and sheet-iron ware, 1 of wire work, 9 of woollen goods, 1 planing mill, 23 flour mills, 13 iron works, and 4 brass foundries. Capitals, Bridgeport and Danbury. II. A N. central county of South Carolina, bounded S. W. by Broad river, and N. E. by the Wateree; area, 680 sq. m.; pop. in 1870, 19,888, of whom 14,101 were colored. It has an uneven surface and a fertile soil. It is traversed by the Charlotte, Columbia, and Augusta, the Spartanburg and Union, and the Greenfield and Columbia railroads. The chief productions in 1870 were 28,005 bushels of wheat, 218,054 of Indian corn, 16,269 of oats, and 14,024 bales of cotton. There were 1,142 horses, 2,556 mules and asses, 2,891 milch cows, 3,900 other cattle, and 6,044 swine. Capital, Winnsborough. III. A central county of Ohio, with a surface diversified by hills, plains, and rolling lands, and a soil of great fertility; area, 490 sq. m.; pop. in 1870, 81,138. It is intersected by the Ohio and Hocking canals, and the Cincinnati and Muskingum Valley and the Hocking Valley railroads; and is drained by the head stream of Hocking river, and by several small creeks. Limestone and freestone are abundant. The chief productions in 1870 were 553,924 bushels of wheat, 1,706,216 of Indian corn, 24,238 of oats, 24,431 of barley, 116,231 of potatoes, 25,107 tons of hay, 609,348 lbs. of butter, and 175,239 of wool. There were 8,728 horses, 7,956 milch cows, 13,204 other cattle, 40,138 sheep, and 85,995 swine; 4 manufactories of agricultural implements, 12 of carriages and wagons, 9 of clothing, 4 of iron castings, 12 of saddlery and harness, 4 of woollen goods, 2 planing and 9 saw mills, 8 tanneries, 8 currying establishments, 4 breweries, and 18 flour mills. Capital, Lancaster.

FAIRFIELD, a town, port of entry, and formerly capital of Fairfield co., Connecticut, on Long Island sound, and on the New York and New Haven railroad, 20 m. W. S. W. of New Haven; pop. in 1870, 5,645. The village is half a mile from the sound, principally on one broad street, and in the vicinity is a spacious hotel for summer visitors. The village of Greenfield Hill, in which Dr. Timothy Dwight resided, is in this town. About 1½ m. E. of Fairfield village is Black Rock, one of the finest harbors in Connecticut, accessible for large vessels at all times of the tide. About 2 m. W. of Fairfield, at the mouth of Mile river, is the village of Southport, the principal business centre of the town. The value of the foreign commerce for the year ending June 30, 1873, was \$29,410. There were registered, enrolled, and licensed 184 vessels of 11,507 tons, of which 175 of 8,918 tons were sailing vessels, 7 steamers, and 2 barges; built during the year, 19 vessels of 210 tons. The town contains 2 carriage factories, a harness factory, a national bank, a savings institution, an insurance agency, 16 public schools, and 7 churches. Fairfield was settled in 1689, and incorporated in 1616. In 1779 it was burned by the British

under Gov. Tryon. Since the census of 1870 a portion containing about 1,900 inhabitants has been annexed to Bridgeport.

FAIRIES, supernatural beings, generally human in appearance, but endowed with superhuman power, who have played an important part in the popular superstition of nearly all nations, and are still believed to exist by the common people of many countries. The origin of the word is obscure, but it is probably related to the Latin *fata* (pl. of *fatum*), which is the Italian (sing.) for fairy. The difference between a fairy and a god or goddess of ancient Greece and other polytheistic lands is very small in regard to the superhuman power which they are believed to possess; but fairies are never objects of worship, or of religious sentiment and ceremony, though occasionally invoked for aid, or propitiated. Fairies are believed to suffer death after a more or less extended period. They are either benevolent or malicious, and accordingly either the protectors or persecutors of human beings. Some seem to have no other purpose than that of enticing young mortals into their habitations, and treating them for a season to all manner of sensual pleasure. Their nature varies, however, with every nation.—The *apsins* of the Hindoo Vedas are the general helpers of favorite individuals; they assist in love intrigues, remove bodily infirmities, supply riches, succor in danger, and ride in chariots of gold. But numerous similar beings are spoken of in the Vedas, and it may be that the *adityas*, also commonly mentioned with the epithet *asura*, belong to the same class. The *peris* of the Persian legends are delicate creatures of wondrous beauty, and either male or female. They protect mortals against the power of the *devs*, who strive to drag them into sin and eternal destruction. Though not immortal, they enjoy great longevity; and though possessed of superhuman power, they are quite human in sentiment and passion. The Arabs believe in *jinns*, who take the place of the Persian *peris*, and fight against the *devs*. They are said to have lived on earth several thousand years before Adam, and a tradition from the prophet says they were formed of smokeless fire. They are to die before the general resurrection, but many of them have already been slain by shooting stars hurled at them from heaven. Not all are obedient to the will of God; some become ghouls and side with the *devs*. They are said to dwell with the *peris* in the mountains of Kaf, or Jinnestan, which is the boundary region of the flat circular earth. They propagate their species, and unite sometimes with human beings. They can render themselves visible and invisible, and assume the form of animals. The Jews believed in beings like the Arabian *jinns*, whom they called *shedim*, *sehirim*, or *mazzikim*. According to Talmudical legends, the *shedim* were offspring of Adam, who after having eaten from the tree of life was under excommunication for 180 years, and begat during that time spirits, demons,

and spectres of the night. They are said to resemble angels in being able to see without being seen, in having wings, and in knowing the future; and to resemble man in eating and drinking, marrying, and bearing children, and in being subject to death. They have the power of assuming any form they please. The Grecian mythology abounds in personifications, and the beings who presided over the various parts of external nature were mostly conceived to be females, and were denominated nymphs, which originally signified newly married women. They were always represented in the perfection of beauty, and dwelt, under the various names of oreads, dryads, naiads, limniads, and nereids, in mountains, trees, springs, lakes, the sea, caverns, and grottoes. Their life resembled that of women, and they occasionally bestowed their love on mortals. They possessed power to reward and punish, and to protect and persecute. The fairies of the Romans were like those of Greece, and were generally supposed to lead a solitary life in fountains, streams, and lakes. Of these Egeria, Anna Perenna, and Juturna were the most famous. The rural lares resembled the Gothic dwarfs in size, and were regarded as being the souls of dead men who lingered near their earthly habitations. The lares formed part of the Etrurian religion, and differed from the penates, who were not fairy-like beings, but gods, or personifications of natural powers.—The old Italians believed in a being, called an incubo, that had the power of revealing hidden treasures. A being very much resembling it occurs still in the popular tales of modern Naples. He is a stout little man with a broad-brimmed hat and a long coat, and leads people to places where treasures are concealed. His name is Monacello, which is given also to other diminutive beings resembling the house spirit of the Germanic nations. The most prominent figures in ancient and modern Italian legends are the *fate*. These beings are ruled by Demogorgon, who resides in the Himalaya mountains, and are summoned to him every fifth year. One of them, the Fata Morgana, was the personification of Fortune, and plays an important rôle in the *Orlando innamorato*. In that poem Boiardo introduces the Fata Silvanella, who raised a tomb over Narcissus, and then dissolved away in a fountain; and when Brandamarte opens the tomb and kisses the hideous serpent that thrusts out its head, it becomes a beautiful maiden. Other fate are Nera, Bianca, Alcina, Dragontina, and Falerina. The fairies of Spain are not very numerous, and Spanish fairy lore is very scanty. There is a tale of a girl seized by demons who reside at the bottom of a lake; another of a nobleman who married a woman that flew into the air at hearing the name of the Virgin Mary; and another of a hunchback musician, who was one night surrounded by little beings, whom he so pleased with his art that they removed his hunch. The greatest reputation

is enjoyed by the duendes and trasgos, who resemble the house spirits.—The dracs of southern France assume the human form, reside in the caverns of rivers, and entice bathing women and boys. The follets inhabit the houses of simple country people, and are invisible, though their voices are heard; their chief employment seems to be pelting people with stones and household utensils. There are also accounts of spirits who suddenly enter a house, ransack and upset everything, and torment those who are sleeping in it. The fadas were fairy ladies who became the spouses of men, and lived with them in great felicity; but when a husband discovered the secret of their nature, or became unfaithful, he either died instantly or led a wretched life for the remainder of his days. The fées, lutins, or gobelins of the north of France are similar to the kobolds and nisses of other nations. The fées are small and handsome, dance in circles or fairy rings by night, haunt solitary springs and grottoes, mount and gallop strange horses, sitting upon the neck and tying together locks of the mane to form stirrups, always bring luck by their presence, and, like the fairies of most countries, were believed to preside at births, to love young children, to give them presents, and to steal them away, leaving instead their own fairy offspring, which were called changelings, and were unusually beautiful in countenance but evil in propensities. In the 12th and 18th centuries the forest of Brezeliande, near Quenton in Brittany, was thought to contain the tomb of Merlin, and to be a chief seat of the fairies. The white ladies were Norman fairies, and often malignant. They were supposed to be attached to certain great families, in whose affairs they interfered, sometimes for good, sometimes for evil. The white lady of Avenel in Scott's romance of "The Monastery" is an instance of this kind. The lutins or goblins were playful and malicious elves, pinching children and maidens, twisting their hair into inexplicable knots when they were asleep, and delighting to perplex peasants and to bring them into difficulty. One of the chief articles of accusation against the maid of Orleans was that she resorted to a fountain of the fairies to see her visions; and in Brittany there are fountains still regarded by the natives as sacred to the fairies, and believed to sometimes change into gold or diamond the hand that is inserted into them.—The Eddas of the Scandinavians tell of alfs that are either whiter than the sun and live on earth, or blacker than pitch, and live under ground; and of dverggar, who are diminutive beings dwelling in rocks and hills, and skilful workmen in gold, silver, and iron. The alfs live still in the imagination of the peasantry of Scandinavia, and are distinguished as either white or black. The white alfs are the good elves, who dwell in the air, dance on the grass, and have when they show themselves a handsome human form. The black alfs are the evil elves, who frequently inflict

injury on mankind. The elves are believed to have kings, and to celebrate weddings and enjoy banqueting, and singing. The Norwegians call the elves *huldrarfolk*, and their music *huldraslaat*. There is also a tune called the elf king's tune, which is well known, but not sung or played; for as soon as it begins both old and young, and even inanimate objects, are impelled to dance, and the player cannot stop unless he manages to play the tune backward. The Danes call the elves *ellefolk*, and believe that they live in *elle moors*. An elf man is an old man with a low-crowned hat. The elf woman is young and fair in front, but behind she is hollow like a dough trough; and she has an instrument which when she plays on it ravishes the hearts of young men. The more usual appellation of the dwarfs is *troll* or *troll*, and they are represented as living either in single families or in large communities inside of hills and mounds. Their character seems to have gradually sunk down to the level of the peasantry. They are regarded as rich, obliging, and neighborly, but they have a sad propensity for stealing. The nisses are domestic fairies of Norway, and are fond of frolicking by moonlight and of driving in sledges in the winter. Every church had its niss, who was then called a *kirkegrim*; it looked after propriety of manners and punished misconduct. The rivers and lakes are inhabited by necks, *stromkarls*, and other beings similar to mermen and mermaids. They are wonderful musicians, and when they play on their harps all nature has to dance.—The Germans believed in dwarfs and elves, wild women, kobolds, and nixes or water spirits. The dwarfs were also known as the still people and the little people, and had their abodes underground and in the clefts of mountains. They visited the surface of the earth only by night, and could render themselves invisible and pass through rocks and walls. They were generally benevolent. The beings called "little wights" inhabited southern Germany. They are only a few inches in stature, and look like old men with long beards, dressed like miners, with lanterns and tools. They announce a death in a family by knocking three times. The wild women are beautiful, and live in the mountain Wunderberg, on the moor near Salzburg. Kobolds assist in the household, and love to play tricks on the servants. The miner's kobold reveals valuable veins and protects the virtuous. The nixes inhabit lakes and rivers; the male is like a man, old and long-bearded, has green teeth, and always wears a green hat; the female appears sometimes as a beautiful maiden, but often in a body terminating in the form of a fish or of a horse. They have magnificent dwellings under the water, to which they love to entice handsome mortals. They comb their golden locks on sunny days, sitting on rocks and trees.—In Ireland and Scotland fairies were believed to shoot at cattle with arrows

headed with flint, and thus to bewitch them; these small arrowheads are known to the country people and antiquaries as elf arrows. The elf fire was the *ignis fatuus*, and other luminous points on moors and heaths were called fairy sparks. A mole or defect on a person was a fairy nip or an elvish mark, and a matted lock of hair in the neck an elf lock. The Gaelic fairies are very handsome, are usually attired in green, and dance, lend and borrow, and make shoes very rapidly. The Gaels call them *daoine shì* or men of peace, and their habitations *shiàns* or *tomhàna*, which are like turrets, and consist of masses of stone. Some mortals have been among them, and after banqueting with them they fell asleep and awoke after a hundred years. The brownie and kelpie of the Highlands seek to decoy unwary people to ride on them when they appear in the form of horses, and plunge with them into the neighboring loch or river.—The fairies of England correspond with those of the Scandinavians and Germans, but the fairies of the English people are somewhat different from those of the poets. The popular fairies were either rural elves, inhabiting woods, fields, mountains, and caverns; or house spirits, usually called hobgoblins or Robin Goodfellows. The fairies of the "Faerie Queen" of Spenser and those of the "Midsummer Night's Dream" are not the same. The former are stately beings, typical of the moral virtues, with traits borrowed from the Italian fairy mythology, dwelling in enchanted castles, surrounded by courts of knights and ladies, and ruling over extensive kingdoms. Shakespeare adopted the elves and pixies of popular superstition, with their diminutive stature, fondness for dancing, love of cleanliness, and child-stealing propensities, formed them into a community ruled over by Oberon and Titania or Queen Mab, and gave immortality to "that merry wanderer of the night," Puck, alias Robin Goodfellow, alias Hobgoblin. The "Mad Pranks and Merry Jest of Robin Goodfellow" (printed by the Percy society, 1841) was originally published in the age of Shakespeare, and furnishes the first records of this mischievous son of a fairy, who "from haggard Merlin's time" had been famous for his pranks. Corresponding to him are the Rübezahl or Number Nip of German fairy lore, the Cluricaune of Ireland, the Eulenspiegel of Germany, and the Howleglass or Owlespiegle of Scotland.—The North American Indians have many quaint fairy legends, which have been collected and narrated by Schoolcraft; and it appears from Mitford's "Tales of Old Japan" that the Japanese have numerous books of fairy stories, in which the fox plays an important part. These stories are mostly for children.—The earliest collection of European fairy stories in prose was the Italian *Notti piacevoli* of Straparola (Venice, 1550). The best Italian collection is the *Pentameron* of Giambattista Basile (Naples, 1637; translated from

the Neapolitan by W. E. Taylor, London, 1856); it is full of learned allusions and keen satire, and designed for the amusement only of grown persons. Near the end of the 17th century the *Contes des fées* of Perrault and Madame d'Aulnoy, and their successors, gave vogue to fairy stories throughout Europe, written chiefly for the instruction and amusement of children. The "Arabian Nights' Entertainments," introduced into Europe by Galland about the beginning of the 18th century, contributed much to their popularity, and was quickly followed by various imitations of the Arabian, Persian, Turkish, and Mongol tales. The "Tales of the Genii" by James Ridley, the *Fables et contes indiens* of Langlès, and the later *Contes chinois* of Rémusat, are examples. The best later imitations are some of the tales of Tieck, Musäus, and Novalis, and especially of La Motte Fouqué, and the romance of the caliph "Vathek," by Beckford. Hans Christian Andersen's fairy tales hold a high rank in this species of literature.—The best works on the subject are Keightley's "Fairy Mythology" (enlarged ed., 1850); Scott's "Essay on the Fairy Superstition," in the "Minstrelsy of the Scottish Border;" Croker's "Fairy Legends and Traditions of the South of Ireland" (1825); Dalzell's "Dark-er Superstitions of Scotland" (1838); "Russian Popular Tales," translated from the German of Dietrich, with an introduction by Grimm (London, 1857); Dasent's "Popular Tales from the Norse" (1859); Strahlheim's *Sagenschatz aller Völker der alten Welt* (Frankfurt, 1862); Braun's *Naturgeschichte der Sage* (2 vols., Munich, 1864-'5); and Kremer's *Ueber die sudarabische Sage* (Leipzig, 1866).

FAIR OAKS, Battle of. See CHICKAHOMINY.

FAITHFUL, Emily. See supplement.

FAITHORNE. I. WILLIAM, an English engraver, born in London about 1625, died there in May, 1691. He was a pupil of Sir Robert Peake, served under him in the royal army, and was captured at Basinghouse and confined in Aldersgate. He was at length released and went to France, where he received instruction from Robert Nanteuil. In 1650 he was permitted to return, and set up a shop near Temple Bar, where he did a large business in Italian, Dutch, and English prints, and also continued his professional work. He is most famous for his portraits, of which he produced a large number, including Cromwell, Prince Rupert, Milton, Sir Thomas Fairfax, Thomas Hobbes, and Robert Boyle. In 1662 he published a treatise on engraving and etching. II. WILLIAM, son of the preceding, born in 1656, died in 1686. Like his father, his best works were portraits; but he confined himself mainly to the mezzotint process. He became dissipated, and died early. Among his portraits are those of Mary, princess of Orange, Queen Anne when princess of Denmark, and Dryden.

FAKIR (an Arabic word meaning a poor man), the name of a mendicant order in the

East Indies, like the dervishes of Persia and Turkey. The first condition of an Indian mendicant monk is poverty. He wears a rent robe, such as the Mussulmans pretend the ancient prophets wore. In 10 things, according to Hassan al-Basri, he is like a dog: he is always hungry; he has no sure abiding place; he watches by night; he never abandons his master, even when maltreated; he is satisfied

is highly honored. They are the children of poor parents, who live in retirement in mosques, devoted to the reading of the Koran and the study of the laws, till they become qualified for the duties of *mollahs* or doctors of theology. The fakirs often inflict upon themselves very severe penances. Some remain bent forward in the form of a right angle until they grow permanently into that shape. Others lay fire on their heads till their scalps are burned to the bone. Sometimes a fakir ties his wrists to his ankles, has his back plastered with filth, and then makes a journey of hundreds of miles, rolling along like a cart wheel, and stopping at the villages for rest and food.

FALAISE (Lat. *Falesia*), a town of Normandy, France, in the department of Calvados, 22 m. S. S. E. of Caen, on the river Ante, and on a branch of the Western railway; pop. in 1866, 8,621. It is built upon cliffs, commanded by an old Norman castle and surrounded by a picturesque country. It has a communal college, a public library, several ancient churches, and an equestrian statue of William the Conqueror, who was born here, erected in



Fakirs performing Penance.

with the lowest place; he yields his place to whoever wishes it; he loves whoever beats him; keeps quiet while others eat; accompanies his master without ever thinking of returning to the place he has left; and leaves no heritage after death. The number of Mussulman and Hindoo fakirs in India is estimated at more than 1,000,000; besides whom there are many other religious ascetics. Some fakirs remain isolated, go entirely naked, and sleep on the ground with no covering. They never use wood for making fire, but employ the dried dung of cows; regarding this as an act of devotion, since the cow is a sacred animal in India. They carry a cudgel, a battle axe, or spear, on which are hung rags of various colors, and they traverse the country begging and instructing credulous people in religion. It is dangerous both to his money and life for an unprotected person to meet them. Another class of fakirs unite into companies, and wear fantastic and many-colored robes. They choose a chief, who is distinguished by having a poorer dress than the others, and who has a long chain attached to one of his legs. When he prays he shakes his chain, and the multitude press around him, embrace his feet, and receive his counsel and precepts. He has formulas for the cure of the paralytic, and especially of sterile women. One class of fakirs

Castle of Falaise.

1851. The celebrated fair of Guibray, instituted in the 11th century, is annually held here in August in a suburb of that name. The town has manufactures of cotton and hosiery.

FALASHAS, the Jewish population of Abyssinia, numbering about 250,000, who have inhabited that country from time immemorial. Their name signifies exiles or wanderers, and they profess to have come originally from Pal-

estine and to have belonged to the tribe of Levi. They are Jewish in their modes of life, though not in their appearance, and differ from their co-religionists in regarding commerce as incompatible with the Mosaic law. They cultivate the soil, and excel in various trades, especially as architects. They are laborious and well behaved, but unable or unwilling to perform military duty, from which they are consequently exempt. They are so rigid in the observance of the sabbath that they abstain even from dressing themselves on that day. They constituted in the higher regions of the country an independent tribe under the rule of their own kings and queens until the beginning of the 17th century, when they were driven from their mountain homes and compelled to reside among their enemies the Amharas. They live at present in the provinces of Dembea, Godjam, Quara, Tcheiga, and Woggera; and their villages are easily recognized by the red clay pots at the top of their synagogues. They have the Old Testament in the Geez language, and the apocryphal books which are accepted by the Abyssinian church. —See articles by Joseph Halévy in the *Bulletin* of the French geographical society, March and April, 1869.

FALCON, a bird of prey, belonging to the order *raptores*, family *falconidae*, subfamily *falconinae*, and to the typical genus *falco* (Linn.). This subfamily contains the following genera, in addition to *falco*, of which about a dozen species are described: *hypotriorchis* (Boie), with as many species; *ieracidea* (Gould), with two species, found in Australia; *tinnunculus* (Vieill.), with a dozen species; *ierax* (Vigors), with six species, in India and its islands; and *harpagus* (Vigors), in South America, with a single species, characterized by having the lateral margin of the bill armed with two distinct teeth on each side. The birds of these genera may all be called falcons, from the common characters of a short bill, much curved from the base to the tip, with its sides more or less furnished with serrations called teeth; the cere covering the nostrils, which are rounded or linear; the wings lengthened and pointed, the second and third quills generally the longest; the tail lengthened and rounded; the toes long and slender, and claws curved and acute. The birds of the genus *falco*, which only will be treated in this article, are called noble birds of prey, because in proportion to their size they are the most courageous and powerful; they are also more docile, and were formerly much used in the sport of falconry to pursue and kill game, returning to their masters when called. The pigeon hawk (*H. columbarius*), and the sparrow hawk (*T. sparverius*), though both falcons, will be described under these names. The falcons are found throughout the world, regardless of climate; they are powerful and rapid fliers, hovering over their prey and darting perpendicularly upon it; they pursue birds chiefly, but attack also the smaller

quadrupeds. The common or peregrine falcon (*F. peregrinus*, Linn.) has a large and round head, a short thin neck, a robust body broad in front, stout short tarsi, covered with imbricated scales largest in front, the tibial feathers covering the knee, long and strong toes and

Peregrine Falcon (*Falco peregrinus*).

sharp claws. The plumage is compact and imbricated, the feathers rounded on the back, broad on the breast, long and pointed on the sides; between the eye and bill and on the forehead they are bristly. The bill is blackish blue at the tip and pale green at the base, the iris hazel, the feet bright yellow, and the claws black. The head and hind neck in the adult male are grayish black tinged with blue, the rest of the upper parts dark bluish gray with indistinct dark brown bars; the quills dark brown, with transverse reddish white spots on the inner webs; the grayish brown tail has about 12 blackish bars, diminishing in breadth and intensity from the tip; the throat and front of neck white; a broad triangular mark of blackish blue extends downward on the white of the cheeks from the corner of the mouth; the sides, breast, and thighs are reddish white, with transverse dark brown spots; the under wing feathers are whitish, with transverse darker bars. The length is about 16½ in., the extent of wings 30, bill 1½, tarsus 1½, and middle toe 2½. In old males the tints of the back become lighter, sometimes ash-gray; the young males are darker, with rufous tips and edges to the feathers, and the tail is blacker, with reddish white tips and bars; there is considerable variety at the different ages in the birds of the United States and of Europe. Bonaparte calls the American bird *F. anatum*. The adult female, as in birds of prey generally, is nearly one third larger than the male, being about 20 in. in length, 36 in extent of wings, with the beak, tarsus, and toes longer; the color of the upper parts is deeper brown, with the tips of the secondaries and tail whitish; the transverse markings run higher up on the breast, and are broader and

of deeper hue on the other parts; the color below is more yellowish, and the vent feathers are reddish. This falcon, which is also called the great-footed and the duck hawk, according to Audubon, was formerly rare in the United States, which it now can hardly be said to be. It flies with astonishing rapidity, turning in its course in the most surprising manner. A favorite prey is the duck, which it seizes on the wing, on the surface of the water, or on land; when within a few feet of its victim, it stretches out the legs and claws and drops upon the trembling bird almost perpendicularly; if the victim is light, it flies off with it immediately to some quiet place; if too heavy, it kills and devours it in the nearest convenient place. It has been known to attack a mallard on the wing, and even to pounce upon a wounded teal within a few yards of the sportsman. Pigeons, blackbirds, water fowl, and beach birds, and even dead fish, are eaten by this falcon. Turning the bird it has caught belly upward, it clears off the feathers from the breast and tears the flesh to pieces with great avidity. This species is solitary, except during the pairing of the breeding season, which is in very early spring; it is found in all parts of the United States and in Cuba, coming to the south in the winter months. The nest is made of coarse sticks, generally on the shelf of some precipitous rock; Audubon is of opinion that they breed in the United States; they are common on the shores of Hudson bay and arctic America in summer, according to Richardson; the eggs are rounded, reddish brown, with irregular markings of a darker tint. The peregrine falcon is distributed over temperate Europe, where the country is mountainous and the seacoast precipitous. When in full plumage and good condition, for its compact muscular form, great strength, boldness, and ferocity, it may be taken as the very type of a bird of prey; it is among birds what the lion and tiger are among mammals; fearless in attack, swift in pursuit, strong and fierce, it justly claims the first rank among the noble birds of prey.—Before the invention of gunpowder, falcons were very frequently trained to pursue herons and various kinds of game, and falconry was a favorite sport of kings and nobles; even now falcons are occasionally used for this purpose in Great Britain. Birds of prey have been trained to the chase from remote antiquity; the custom is mentioned by early writers, but it was not till the time of Huber, in 1784, that the distinction between birds of high and low flight, which had long been understood in practice, was shown to exist in the anatomical structure of the wings and talons. The falcons belong to the former division; from their long and slender and entire wings, when they wish to rise in the air vertically they are obliged to fly against the wind, though obliquely they easily mount to great elevations, where they sport rapidly in all directions; they carry the head straight; their claws are long,

supple, and sharp, and their grasp is firm; they seize their prey at once if small and slow, but strike repeatedly with their talons to weaken and arrest the flight of heavier and swifter birds, and with great precision attack the vital part at the hollow of the back of the head or between the shoulders and ribs. These birds have been called rowers from their mode of flight. The ignoble birds of prey, as the goshawk and other hawks, are called sailers; their wings are shorter and thicker, with their surface interrupted by the unequal lengths of the quills, and they fly to best advantage with the wind, sailing with the wings extended and motionless, allowing themselves to be carried along by the wind; their talons being shorter, less powerful, and straighter than in the falcon, they strike with less force and precision, and when they have seized a bird or a quadruped compress it to death or strangle it with their claws; their beaks are not toothed, and they can seldom penetrate the skulls of the larger birds; they prefer to hunt in thick woods, while the falcons pursue their prey high in the air. Falcons and hawks are best trained from the nest; they have bells attached to their feet, jesses of soft leather to the tarsi, and hoods on the head which prevent them from seeing while they allow them to eat; birds taken after they have left the nest, or which have been caught in snares, are the most difficult to train, and confinement, hunger, fatigue, and purgatives are employed to subdue them to a point necessary for lessons; they are taught to leap upon the hand of their master to receive food, which is placed on a rude representation of the bird or animal which they are to be taught to pursue; from an effigy they are advanced to living animals, with more or less length of tether, until left at perfect liberty. The larger and older the bird, the more difficult the training, and the most ignoble are generally the most rebellious; in the order of docility these birds are the merlin, the hobby, the common falcon, and the gerfalcon (all noble birds); and the ignoble hawks are the least docile, though the goshawk is said to be very easily trained. They are fed with beef and mutton, deprived of all fat and tendon, and scrupulously cleaned of all dirt; they are taught to pursue other birds of prey, the heron, the crow, the pie, larks, quails, partridges, the hare, and other game. Descriptions of the lordly sport of falconry can be found in the romances of Walter Scott and other delineators of the days of chivalry. (See FALCONRY.) The falcon is a very long-lived bird; there is a tale that one which belonged to James I. in 1610, with a gold collar bearing that date, was found at the Cape of Good Hope in 1793, and, though more than 180 years old, was said to be possessed of considerable vigor; but the natural term of life of this species must be much less. The falcon of Henry IV. of France flew from Fontainebleau to Malta, 1,000 miles, in a day; and many similar instances of their speed are on record.—

The lanner (*F. lanarius*, Linn.) seems to be an undoubted species of northern Europe and Asia, and intermediate between the gerfalcon and the peregrine; it is about 1½ ft. long, with wings two thirds as long as the tail; its colors resemble those of the young peregrine, and the

Lanner Falcon (*F. lanarius*).

name has even been applied to immature birds of this species; but Mr. Gould, in his "Birds of Europe," figures and describes it as distinct. It has not the black spots on the cheeks, and the markings of the breast are longitudinal instead of transverse.—The Iceland falcon or gerfalcon (*F. gyrfalco*, Linn.) is the largest of the genus, and varies much in its appearance at different ages. In the adult the head is nearly white, the feathers of the crown having hair-brown shafts, those of the nape having the brown more extensive; the under parts are white, the breast, thighs, and tail coverts pure white, but the sides and abdomen are often

Gerfalcon (*Falco gyrfalco*).

spotted and lined with brown; the upper parts have the centre of the feathers hair-brown, with a white margin; the greater coverts, secondaries, and quills are barred with brown and edged with white, and the two central feath-

ers of the otherwise white tail are barred with brown; the bill is pale bluish gray, with the upper tooth and the lower notch strongly developed; the legs and feet are colored like the bill. Some specimens are almost entirely white. The length is from 20 to 24 in., the extent of wings a little over 4 ft., the bill 1½ and the tarsus 2 in.; according to Audubon, in the immature state, as observed by him in Labrador, the female, though the larger and heavier bird, has the extent of wings less by an inch than the male; the weight of the male is a few ounces less, and that of the female a few ounces more than 8 lbs. The form is that of a very powerful bird, the tail being longer in proportion than that of the peregrine, and the tarsi feathered 1½ in. downward. It ranges over the northern regions of Europe and America; Iceland is one of its favorite resorts, so much so that the bird has received one of its most common names from this island; it is found along the precipitous shores of Norway and Sweden, and in Greenland, the arctic regions, and the Hudson bay district, extending as far south as Labrador, where Audubon found it breeding; it is rare in Great Britain, and is a northern and maritime species, especially frequent near the breeding places of sea fowl. In manner, flight, and cry it resembles the peregrine, being if possible more daring. In falconry this species was highly prized, and extraordinary prices were formerly paid for individuals; they were brought chiefly from Iceland and Norway. There is still much uncertainty about the varieties of this bird; naturalists generally make but one species, but falconers are of opinion that the Iceland and the Norway birds are distinct species; if the latter be true, the American bird may also prove different from any of the European species. The American bird is sometimes called *F. Islandicus* (Gmel.). Audubon describes and figures a pair of immature birds which he obtained in Labrador in August. The general color of the plumage in this condition is brownish gray above, the feathers having a narrow paler margin; the upper tail coverts, quills, and tail are tipped, spotted, and barred with brownish white; the throat is brownish white, with five streaks of brown, and the lower parts generally are of the former color, longitudinally patched with dark brown; the under tail coverts are striped alternately brown and white. The female has the same colors, except in having the two middle tail feathers spotted with white like the others, these in the male being without the spots. The nest found by Audubon was about 2 ft. in diameter, flat, made of sticks, seaweed, and mosses. The eggs, according to Mr. Yarrell, are dull white, mottled all over with pale reddish brown. They feed in Labrador on puffins, grouse, partridges, ducks, hares, and other animals of this size, and also on fish. Mr. Hancock ("Annals and Magazine of Natural History," vol. xiii., 1854, p. 110), who described the Greenland falcon (*F.*

Groenlandicus, Hanc.) as a distinct species, says it is never dark-colored like the young of the Iceland falcon, its plumage from the nest being whiter than the mature livery of the latter, and not unfrequently as white as that of the adults of its own species. The mature Greenland bird is distinguished from the young by the cordate and arrow-head markings of the back and scapulars; the young have above large oblong spots, with long narrow dashes on the head and lower parts, the marking from dark gray becoming with age almost black; the cere, feet, and toes also change from light livid blue to pale yellow. Like other falcons, it gets the mature plumage at the first moult. In fact, the Greenland falcon may be said to have a white plumage with dark markings, and the Iceland bird dark plumage with white markings; whether they are distinct species will be determined by the definition of what constitutes specific characters. Both species occur in America; the Greenland bird probably does not breed in Iceland, and is only occasionally seen there, driven from its more northern haunts by severe weather; the Iceland bird sometimes breeds in Greenland. The weight of evidence seems to be in favor of these birds being distinct species.—Other falcons, which have been trained to pursue game, are the *H. subbuteo*, *H. asalon*, and *T. alaudarius*, which will be described respectively under the popular names of HOBBY, MERLIN, and KESTREL.

FALCONE, Aniello, an Italian painter, born in Naples in 1600, died in France in 1665. He was a pupil of Spagnoletto, and set up an academy of his own. At the time of Masaniello's revolt he formed his pupils into a secret band for retaliation upon the Spaniards. When the insurrection was ended he fled to France, where he was employed by Colbert. He is especially famous for his battle pieces. They are not numerous, and command great prices. Their excellence is in their extreme fidelity to nature, and their brilliant coloring. Salvator Rosa was one of his numerous pupils.

FALCONER, Hugh, a British palaeontologist, born at Forres, Scotland, Feb. 29, 1808, died in England, Jan. 31, 1865. He studied at the universities of Aberdeen and Edinburgh, received his diploma as physician in 1829, was employed as surgeon by the East India company, and in 1832 as director of a botanical garden in one of the Anglo-Indian towns, whence he explored the Himalaya. He published "Selections from the Bostan of Saadi" (London, 1838), and (jointly with T. Proby Cantley) *Fauna Antiqua Sivalensis* (1846), a laborious work, with descriptions of numerous fossils in the Sivalik hills. The "Palaeontological Memoirs of Hugh Falconer" (2 vols., 1868) include a sketch of his life.

FALCONER, William, a British poet, born in Edinburgh about 1730, lost at sea in 1769. He was the son of a barber, whose other children were all deaf and dumb. At the age of 18, being second mate of the *Britannia*, he was

shipwrecked off Cape Colonna, on the coast of Greece, and was one of the three who survived the wreck, which afterward became the subject of his principal poem, "The Shipwreck." This was published in 1762. He compiled a "Universal Marine Dictionary" (republished in 1815, enlarged and modernized by W. Burney, LL. D.), and wrote several poems, including a political satire directed against Lord Chatham, Wilkes, and Churchill. In 1769 he sailed for India in the frigate *Aurora*, which, after touching at the Cape of Good Hope, was never heard from again.

FALCONET, Etienne Maurice, a French sculptor, born in Paris in 1716, died in 1791. He was a pupil of Lemoine, and early gained distinction by a statue of Milo of Crotona. Many of his works were destroyed at the time of the revolution. None of them were equal in merit to the immense bronze equestrian statue of Peter the Great, which he executed at St. Petersburg, by order of Catharine II., in 1776-'8.

FALCONRY, the art of training falcons or other birds of prey for the chase, the sport itself being called in English hawking, in French *le vol*. A falconry is also the place where such birds are kept. The practice is very ancient in Europe, and yet more so in Asia. We have no mention of it among the Romans till after the time of Vespasian. It was certainly in existence in the 4th and 5th centuries. In Britain it appears to have been a favorite recreation in the reign of Ethelbert II. of Kent, A.D. 760. King Alfred had his falconers, and a book on falconry is still extant attributed to Edward the Confessor. Harold II. is represented in the Bayeux tapestry as visiting the court of Duke William of Normandy with a hawk on his fist. The Domesday book makes frequent mention of falconries and eyries for breeding. In the time of Henry II., William Knot, the king's tenant, paid his rent at the exchequer in three hawks and three gerfalcons. King John was devoted to the sport. Nicholas, a Dane, was to give the king a hawk every time he came trading to England. The sport died out in England in the time of the Stuarts. In France falconry was most practised in the time of Francis I. (1515-'47). His grand falconer had an annual revenue of 4,000 florins, and had under him 50 gentlemen and 50 falconers, the whole establishment costing annually 40,000 florins. Under Louis XIV. the institution was yet more expensive. Louis XVI. tried in vain to reduce the expense of the royal falconry; but finally the revolution swept it away. In Germany the sport was honored in the reign of Frederick II., and in the 14th century fiefs called *Habichtelehnen*, or hawk tenures, were granted on condition of payment in trained hawks. The sport retained its existence in Germany till toward the close of the 18th century. In Italy falconry was a favorite pastime. In the East, the Persians are skilful in training falcons to hunt all manner of birds, and even gazelles.—The vocabulary of hawking in Eng-

land was as extensive as its ordinances, and several of its terms have been adopted into the language. Hawks' legs were their arms; their talons, pounces; wings, sails; the long feathers of the wings, beams; tail, the train; breast feathers, the mails; crop, the gorge. A cover for the bird's head was the hood. When the hawk fluttered to escape, it bated; to sleep was to jouk; to stretch one wing back was to mantle; to shake itself was to rouse; to recross its wings again was to warble; to tear the feathers from its prey was to plume; to raise its prey aloft before descending was to truss; to descend on its prey was to stoop; to fly off after crows was to check. A living prey was quarry; when dead, pelt. Taming a bird was called reclaiming, by the French *affaitage*; and an old, stanch, pattern hawk was called a make-hawk. No rank was excluded from the enjoyment of hawking, but each condition of men must confine themselves to their peculiar grade of hawk and quarry. The sinecure office of grand falconer of England is hereditary in the family of the duke of St. Albans.—Among the most noted treatises on falconry is one written by Frederick II. of Germany (died in 1250), annotated by his son Manfred, and republished with several other treatises by J. G. Schneider in 1788 (2 vols., Leipsic). Others are: the famous "Boke of St. Albans," by Lady Juliana Berners (fol., 1481), containing the "Treatyses perteynyng to Hawkyng, Huntynge, and Fysshynge with an Angle;" *Hieracosphion, vel de Re Accipitraria*, a poem in three books, by De Thou (1584); *La fauconnerie*, by Charles d'Esperon (Paris, 1605); Latham on "Falconry" (1615-18). Among the more recent works on the subject are "Falconry in the British Isles," by Salvin and Brodric (London, 1855), and "Falconry, its Claims, History, and Practice," by G. E. Freeman (London, 1859).

FALERII (also called *Æquum Faliscum* or *Falica*), an ancient city of Italy, one of the 12 Etruscan cities, a few miles W. of the Tiber, and N. W. of Mount Soracte, near Cività Castellana. It was the capital and perhaps the only city of the Falisci, a people of Pelasgic origin, whose territory extended from the Tiber to Lake Vico, and who in the early ages of Rome were reckoned among the most dangerous enemies of the republic. It is first mentioned in 487 B. C., when the Falisci lent their support to the Fidenates, who had revolted against Rome. It was besieged and taken by Camillus about 394. The inhabitants again joined the enemies of Rome in 356; made a treaty in 352; revolted anew about 312, and were subjugated; rose in rebellion again in 293, and again in 241, when they were punished by the destruction of their town. They were removed to a less defensible site, where a colony was established named Junonia Faliscorum, from a famous temple of Juno. The latter site is now occupied only by a farm house and a ruined church, known as Sta. Maria di Falari, but a large portion of the

ancient walls, with their gates and towers, still exists.

FALERNUS AGER, a district in the northern part of ancient Campania, extending from the Massican hills to the bank of the Volturnus, from which the ancient Romans obtained one of their choicest wines. The Falernian wine was red, very spirituous, and most powerful when from 15 to 20 years old. Its excellence is celebrated by the Roman poets, particularly by Horace. It was declining in quality in the time of Pliny, from want of care in the cultivation, and the vineyards disappeared in the 6th century.

FALIERI, Marino, doge of Venice, the most celebrated of the several doges of the same family, born about 1275, beheaded April 17, 1355. In 1346 he rendered eminent services to the republic as commander-in-chief at the siege of Zara in Dalmatia, which was taken after a splendid victory over Louis the Great of Hungary. Subsequently he was Venetian ambassador at Genoa and Rome. In 1354 he was summoned home from Rome, and elected doge although nearly an octogenarian. Within a month the entire Venetian fleet of 61 vessels was captured by the Genoese, with a loss to the former of 4,000 men killed and nearly 6,000 prisoners. Hardly had the new doge succeeded, Jan. 5, 1355, in concluding a four months' truce with Genoa, when a contest broke out in his own palace, which proved fatal to himself. A young nobleman of Venice, Michele Steno, enamored of one of the dogessa's maids of honor, on occasion of one of the balls given during carnival, took liberties with her which, although excusable under the excitement of the season, gave umbrage to the doge, who ordered Steno to leave the palace. The young man, exasperated by this treatment, avenged it by writing upon the chair of the doge the following words: *Marino Falieri dalla bella moglie, altri la gode ed egli la mantiene* ("Marino Falieri's beautiful wife is supported by him, but enjoyed by others"). The doge's wrath knew no bounds, and as the senate and the councils refused to treat the affair as a question of state, and the criminal court sentenced Steno to only a brief term of imprisonment and a year's exile, Falieri determined to wreak vengeance by exterminating the whole body of the nobility, who were hated by the populace as tyrants. The day fixed for the consummation of this design was April 15, 1355, but the conspiracy was discovered on the evening previous; the doge was arrested, and after a full confession of his guilt, he was sentenced to death and beheaded. In the council hall of the palace, where the portraits of the doges of Venice are religiously preserved, a black drapery covers the spot intended for that of Falieri, bearing the inscription: *Spazio di Marino Falieri, decapitato*. The fate of the doge has been a favorite theme with poets. Byron made it the subject of a tragedy, giving in the notes a full account of Falieri's life.

FALK, Johann Daniel, a German philanthropist and author, born in Dantzic in 1768, died Feb. 14, 1826. He entered the university of Halle, where he produced several satirical poems, which attracted the notice of Wieland, who introduced him into the literary circles of Weimar. He wrote an account of his personal intercourse with Goethe, which appeared after the death of both (*Goethe aus näherem persönlichem Umgange dargestellt*, 2d ed., Leipzig, 1836). A selection of Falk's writings appeared in 1818, and a new collection of his satirical works in 1826. He wrote for the *Taschenbuch*, of which he was the editor (1797-1808), an article on the condition of hospitals in Berlin, which induced the government to reform them. In 1818 he founded at Weimar an institution for the education of poor children, which bears the name of *Falkisches Institut*.

FALKIRK, a municipal and parliamentary burgh of Stirlingshire, Scotland, on a commanding eminence, 24 m. W. of Edinburgh; pop. in 1871, 9,547. Its name, Fallow Kirk, is a translation of the obsolete English *breck*, both signifying speckled church. It has a fine parish church, several churches of dissenting congregations, a school of art, and a horticultural society. There are in Falkirk, and in the connected villages of Grahamston, Bainsford, and Carron, printing establishments, tanneries, breweries, a manufactory of pyroligneous acid, the immense iron works of Carron, a foundry employing 500 men, and branches of the banks of Scotland and England. Its chief celebrity is due to its cattle fairs, the most important in Scotland, which take place annually in August, September, and October, each lasting from two days to a week. The last is the largest. These *trysts*, as the Scots call the fairs, have flourished more than 200 years. Falkirk was a place of note in the 11th century. The ancient parish church, built by Malcolm Canmore in 1057, was demolished in 1810 to give place to the present one. Here Edward I. in 1298 conquered William Wallace, and in 1746 the young pretender, Charles Edward, defeated the English army under Gen. Hawley.

FALKLAND, a royal burgh of Fifeshire, Scotland, at the base of the Lomond hills, 22 m. N. of Edinburgh; pop. in 1871, 1,144. The E. Lomond hill rises so abruptly behind it as to intercept the rays of the sun during several weeks in the winter. The town consists principally

of a single street, and many of the houses have an antique appearance. The chief object of interest is the ancient palace, now in ruins, begun about 1500 and completed by James V., who died in it in 1542. It ceased to be a royal residence on the accession of James VI. to the

Palace at Falkland.

English throne, but was visited by both Charles I. and Charles II. No traces now exist of the more ancient castle in which David, duke of Rothesay, was starved to death in 1402. The English family of Cary derive from this place the title of viscount.

FALKLAND, Lucius Cary, viscount, an English politician and man of letters, born at Burford, Oxfordshire, in 1610, killed Sept. 20, 1643. His father, Sir Henry Cary, who was made Viscount Falkland in the peerage of Scotland in 1620, held various offices under James I. Lucius was educated at Trinity college, Dublin, and at St. John's college, Cambridge, and at the age of 19 inherited the estate of his grandmother, wife of Chief Baron Tanfield, worth more than £2,000 per annum. He afterward married and settled at Great Tew, near Oxford, and in 1638 became Lord Falkland by the death of his father. In his country life he had for his associates learned men from Oxford and London, and was distinguished for hospitality and considerate benevolence. Falkland wrote both in prose and verse. He studied theology deeply, published a "Discourse of the Infallibility of the Church of Rome," and was the author of other works, now little known. He was chosen a member of the short parliament in April, 1640, for Newport, Isle of Wight, and afterward of the long parliament, and shared deeply in the determination to establish the government on a constitutional basis. He was a strenuous advocate of the bill of attainder, even when it was opposed by Pym and Hampden, who preferred proceeding by impeachment. He moved the im-

peachment of the lord keeper Finch. He distinguished himself in the attacks that were made on ship money, and on the judges who had pronounced the levying of it legal, and in those which were directed against the church. But suddenly, without apparent cause, he left the reform party, and he who had said the bishops were stark mad, and therefore should be sent to Bedlam, was soon heard to complain that they who hated the bishops hated them worse than the devil, and they who loved them did not love them so well as their dinners. In the memorable debate on the grand remonstrance, Falkland was the second speaker, following Hyde, and against the remonstrance. His course on this occasion, with his earlier opposition to the abolition of the church, led the king to make him the offer of the post of secretary of state, which he accepted. Of the exact part which Falkland had in the government scarcely anything is known, but he and his two associates in the administration, Colepeper and Hyde, received marks of hostility in the commons. He wrote the royal answer to the parliament's 19 propositions, then joined the king at York, and signed his declaration that he did not mean to make war on the parliament. Shortly afterward Falkland was removed from the commons, and placed on the list of those whom the parliamentary commander was ordered to exclude from mercy. He behaved with gallantry at the battle of Edgehill, and had his advice been taken the king would have won a complete victory. In some negotiations that followed, he labored earnestly for peace. The campaign of 1648 was for a long time favorable to the king, and Falkland accompanied him to Bristol, and thence to the siege of Gloucester. The advance of the parliamentary army compelled the king to raise the siege. In the first battle of Newbury Falkland placed himself at the head of Sir John Byron's regiment. Receiving an order to charge a body of foot, he advanced between hedges lined with musketeers, and received a ball in the stomach, from which he died instantly. The body was found the next day, and buried in Great Tew church. He left a wife and three sons. Among the best works which treat of him is Forster's "Historical and Biographical Essays" (London, 1858).

FALKLAND ISLANDS (*Fr. Malouines*; *Sp. Malvinas*), a group in the S. Atlantic, belonging to Great Britain, and consisting of about 200 islands, 800 m. E. of the entrance to the strait of Magellan, between lat. 51° and 52° 45' S., and lon. 57° and 62° W.; area, about 7,600 sq. m.; pop. in 1871, 812. All but two are very small. East Falkland is about 90 m. long, 40 m. broad, and 3,000 sq. m. in area; West Falkland, separated from the former by a channel from 2½ to 18 m. wide, called Falkland sound, is 80 m. long, 25 m. broad, and about 2,300 sq. m. in area. The other principal islands are Great Swan, Saunders, Pebble,

Keppel, Eagle, Weddell, and Lively. The coasts are very irregular, in some places rocky and precipitous, in others low. Bays and inlets are numerous, and East and West Falkland are nearly divided by several deep indentations. There are few rivers, the San Carlos, 80 m. long, which flows into the sea on the N. W. coast of East Falkland, being the largest. There are many fresh-water ponds and brooks. The surface is broken by ridges of bleak hills, the highest of which are in East Falkland, though the average elevation of West Falkland is the greater. Mt. Usborne, one of the Wickham hills, in the E. island, is 2,800 ft. above the sea; the other summits are from 800 to 2,000 ft. high. The country south of the Wickham hills is a level plain. The whole aspect of the group is dreary and uninviting. The commonest geological formation is quartz, which in some places is seen covering the bottoms of the valleys, broken into sharp fragments, and disposed in level sheets or streams like rivers of stone. Sandstone and clay slate also occur. The soil of such portions as have been explored is mostly peat or sandy clay covered thinly with vegetable mould. The valleys of the streams are exceedingly rich. The climate is like that of England, but more equable. The temperature of summer ranges from 45° to 70° F., and that of winter from 30° to 50°; mean temperature of the year, 47°. Severe and destructive snow storms occasionally occur. There are no trees on the islands. The most important production is grass, which grows to a great length and possesses remarkably nutritious properties. Three or four kinds of bushes are found; the common garden vegetables of England thrive; barley and oats are cultivated, but wheat is raised with difficulty. The only quadruped indigenous to the islands is the warrah or wolf fox, which is peculiar to this archipelago. Other animals have been left here by Europeans, and in East Falkland there are many thousand wild cattle sprung from stock thus introduced. Horses, sheep, wild hogs, rabbits, seals, and wild fowl are found, and many French and American vessels hunt the black whale off the W. coast of West Falkland. In 1871 the value of imports was £23,715, of exports £24,692; the revenue was £6,940 (about half of which is a parliamentary grant), the expenditures £6,324. The fisheries and the guano deposits on West Falkland are considerable sources of wealth. A British colony called Stanley, at the head of Port William inlet on the N. E. coast of East Falkland, has an excellent harbor, and is the only settlement in the whole group. Since 1869 the Falkland islands have been the seat of an Anglican bishop. The main object of the British government in keeping up the establishment here is to afford ships a place of call for water and fresh provisions. The total tonnage of vessels entered and cleared in 1871 was 59,979 tons.—The islands were discovered by John Davis, in August,

1592, and were visited a century later by Strong, who called the sound Falkland, and the islands afterward took the same name. The French planted a colony on Berkeley sound, East Falkland, in 1763, and the English established themselves at Port Egmont, West Falkland, about two years later. The French in 1767 ceded their settlement to the Spaniards, who drove away the English in 1770. They afterward restored Port Egmont to the British, and some time later the islands were abandoned by both parties. Buenos Ayres founded a colony in East Falkland in 1823, which in consequence of a dispute was destroyed in 1831 by a United States man-of-war. It was shortly afterward given up to the British.

FALK LAWS. See supplement.

FALKNER, Thomas, an English missionary, born in Manchester in 1710, died at Plowden Hall, Jan. 30, 1784. He was the son of a surgeon, and followed the same profession in South America and other countries. While ill at Buenos Ayres he was attended by members of the society of Jesus. He abjured the Presbyterian faith to join that order, in which he distinguished himself by missionary labors during 40 years, and he was also employed by the Spanish authorities in surveying part of the South American coast. On the dissolution of the order he went to Spain, where he became chaplain to one of his countrymen, whom he accompanied to the vicinity of Worcester, England. He wrote a number of works in different languages, chiefly relating to the American continent. His principal publication, "A Description of Patagonia and the adjoining Parts of South America, and some Particulars relating to Falkland Islands," &c. (Hereford and London, 1774; abridged, "A Treatise of the Patagonians," &c., Darlington, 1788), was translated into German and French.

FALLING STARS. See METEORS.

FALLMERAYER, Philipp Jakob, a German historian and traveller, born at Tschötsch, near Brixen, in the Tyrol, Dec. 10, 1791, died in Munich, April 26, 1862. He served as a sub-lieutenant in the campaigns of 1813-'15, and subsequently became a professor in the college of Augsburg and in the lyceum at Landshut. He travelled in the East from 1831 to 1836, spent several years in southern France, Italy, and Geneva, made a second tour through Asia Minor in 1840, published the results of his ethnological and historical researches in *Fragmente aus dem Orient* (2 vols., Stuttgart, 1845), visited Palestine and Syria in 1847, was a member of the German parliament in 1848, and became a professor in the university of Munich, but was dismissed in 1849 on account of his liberal views. The most important of his historical writings are *Geschichte des Kaiserthums Trapezunt* (Munich, 1831), and *Geschichte der Halbinsel Morea im Mittelalter* (2 vols., Stuttgart, 1830-'36). In the latter work he maintains that the present inhabitants of Greece have little or no affinity of race

with the ancient Hellenes, and may be considered, notwithstanding their language, a branch of the Slavic family. Many of his essays published in the Augsburg *Allgemeine Zeitung* belong to the best writings of their kind. His *Gesammelte Werke*, published after his death by Thomas, contains the *Neue Fragmente aus dem Orient*, and a large number of political, historical, and critical essays. His works exhibit a rare combination of profound scholarship and philosophical depth with the faculty of presenting the results of scientific researches in a perspicuous and graceful form.

FALLOPIO, or Fallopius, Gabriello, an Italian anatomist, born in Modena about 1523, died in 1562. He was one of the three naturalists who, according to Cuvier, contributed to the revival of the study of anatomy in the 16th century, the other two being Vesalius and Eustachi. He was a pupil of Vesalius, and after travelling through Europe was for a time professor of anatomy at Ferrara, and afterward for several years at Pisa. In 1551 he was appointed professor of anatomy and surgery at Padua, where he also devoted himself to the study of botany, and became director of the botanical garden. He published in 1561 his principal work, *Observationes Anatomicae*, which was one of the best anatomical treatises of his century, and has been several times reprinted. He gave an exact description of the structure of the ear, one of the canals of which still bears his name. He also first indicated the use of the two ducts extending from the ovaria to the womb on each side of the fundus, which are called from him Fallopian tubes. After a short but brilliant career, in which he became distinguished as a professor, botanist, and surgeon, as well as anatomist, he died and left his chair to Fabricius, his pupil.

FALLOUX, Frédéric Alfred Pierre, viscount de, a French author and statesman, born in Angers, May 7, 1811. He first made himself known by a history of Louis XVI. (Paris, 1840; 2d ed., 1848), and by his *Histoire de St. Pie V.* (2 vols., 1844; 8d ed., 1859), the former of which showed his legitimist, the latter his Catholic sentiments. In 1846 he was elected a member of the chamber of deputies, where he took his seat among the legitimists. After the revolution of February, 1848, Falloux was returned to the constituent assembly, where he boldly displayed his anti-revolutionary views. Appointed reporter in the question of national workshops, he moved the dissolution of the chamber, which was the signal for the uprising of the red republicans in June. On Dec. 20, 1848, he was made by Louis Napoleon minister of worship and public instruction, which post he resigned in October, 1849, in consequence of having been censured for submitting to the legislative assembly an organic measure relating to education without having brought it before the notice of the council of state. He then took his place in the legislative assembly. After the *coup d'état* of Dec. 2, 1851, he re-

tired from public life. In 1855 he became assistant editor of the *Correspondant*, the leading Catholic review, and took an active part in the violent controversy which that journal, in the name of the moderate section of the Catholic party, sustained against the *Univers* newspaper. Falloux published on behalf of his friends the pamphlet *Le parti catholique*. He also took an active part in the Catholic congress held at Mechlin in 1867, and with Mgr. Dupanloup supported the doctrines of the syllabus. Among his later publications are: *Mme. Swetchine, sa vie et ses œuvres* (2 vols., 1859); *La convention du 15 septembre* (1864); and *Lettres inédites de Mme. Swetchine* (1866).

FALLOW DEER (*dama vulgaris*), a cervine animal, distinguished from the stag or red deer by its smaller size, spotted coat, and palmated horns. There are two varieties, the one spotted, said to be descended from the spotted axis of India, the other deep brown, said to have been introduced into England from Norway by

buck. The fallow deer breed at two years old, and bring forth one, two, or three fawns; they come to their maturity at three years, and live to about 20. The rutting time of the buck commences about the middle of September, after which he is out of season, his flesh being no longer eatable. He sheds his horns in April or May, and his new ones are fully grown about the end of August. He is in height of season in July. The doe comes into season when the buck goes out, and continues until twelfth tide. She begins to fawn in May, and continues until midsummer. The bucks herd together, and are easy to be tamed, when they become impudently familiar and intimate. The cry of the buck is called braying or grunting, sometimes growling, as that of the hart is termed belling. The fallow deer are kept in England merely as ornaments to park scenery and for supplying venison to the table; never any longer, as of old, for sporting purposes. The venison is more succulent, tender, and juicy than that of the red deer, and it is not unusual to find the buck, in high season, with three and four inches of fat on the brisket. Various pastures produce various degrees of excellence in the venison. Where the wild thyme is abundant, the flesh is noted for its delicious aromatic flavor; and it is remarked that the more level and luxuriantly pastured parks of the south of England produce the fattest venison, while those of the north, abounding in broken ground, glens, and knolls, covered with broom and fern, yield it of the highest flavor.—So late as the reigns of the Stuart monarchs, shooting the fallow deer with the crossbow, coursing it with greyhounds in the royal parks and chases, and turning it out to hunt with the buckhounds, were royal amusements. The buckhounds are still kept up, and the "master of the buckhounds" is a high, honorary court office, held by some sporting nobleman; but they no longer hunt the buck, the hart or stag of the red deer having been for many years substituted for the fallow buck, as being far more cunning, stronger, fleet, and capable of supporting longer chases. In many parts of Germany, in Denmark, Norway, and Sweden, the fallow deer runs wild in the forests, and is strictly preserved for the use of royalty and the territorial nobles. It is usually driven with hounds or beaters, and killed with fowling pieces and buckshot. The height at the shoulders is about 3 ft. The skin affords a valuable leather, and the horns are used for knife handles and similar purposes.

FALL RIVER, a city and port of entry of Bristol co., Massachusetts, on Mount Hope bay, an arm of Narragansett bay, at the mouth of Taunton river, 45 m. S. by W. of Boston; pop. in 1850, 11,524; in 1860, 14,026; in 1870, 26,766, of whom 11,478 were foreigners. It is on high ground, with well shaded streets, handsome churches, and many granite edifices, the stone being obtained from large quarries in the vicinity. It contains two handsome parks, and includes the localities popularly known as

Fallow Deer (*Dama vulgaris*).

James I. It is remarkable that where fallow and red deer are kept together in the same parks, as often in Great Britain, they never associate in companies, much less are ever known to breed in common, but carefully avoid each other, even so far as to shun the places which either species may have chanced to frequent. The bucks of the fallow deer are much smaller than the harts of the red deer, and are easily distinguished by their horns or antlers, which, instead of being round and pointed at the upper extremity, with several forward tines or branches, are round only at the base near the head, having a single pair of brow antlers, and a single pair of anterior points a little higher up the stem, above which the horns spread out into flat palmated surfaces, projecting a little forward at the top, and having several posterior sharp snags or processes. The buck during his first year is called a fawn; the second, a pricket; the third, a sorrel; the fourth, a sore; the fifth, a buck of the first head; the sixth, a great

Copicut, Globe village, Mechanicsville, Mount Hope village, New Boston, and Steep Brook. The Old Colony and Newport railroad furnishes communication with Boston, and the Providence, Warren, and Bristol line connects the city with Providence; while daily lines of steamers run to Providence, Newport, and New York. The harbor is safe, commodious, easy of access, and deep enough for the largest vessels. The value of the foreign commerce for the year ending June 30, 1873, was \$217,028; 53 vessels of 11,833 tons entered from, and 27 of 4,542 tons cleared for foreign ports; entered in the coastwise trade, 413 steamers of 870,592 tons, and 47 sailing vessels of 8,208 tons; cleared, 815 steamers of 828,081 tons, and 25 sailing vessels of 6,075 tons; employed in the cod and mackerel fishery, 37 vessels of 554 tons; belonging to the port, 14 steamers of 2,311 tons, and 127 sailing vessels of 11,411 tons. Fall river, from which the city derives its name, is a small stream emptying into the Taunton near its mouth. It rises in a chain of ponds connected by a narrow channel and covering an area of 5,000 acres, which lie about 2 m. from the bay and receive the outlets of several other sheets of water embracing an area of 2,000 acres more. The river, having a descent of 130 ft. in less than half a mile, and furnished with an unfailing supply of water, possesses remarkable advantages as a mill stream, which have been improved by the erection of a dam at the outlet of the ponds. The lower banks are entirely built up with manufactories, which are now, however, mostly run by steam. The manufacture of cotton goods, which has increased with remarkable rapidity within the last 10 years, is the chief industry, Fall River containing more spindles than any other city in the United States. Print cloths are the principal item of production. The number of corporations is 84, of which 16 have been formed since 1870, having a capital of \$14,870,000, and owning 41 mills with 29,521 looms and 1,269,788 spindles; hands employed, 15,145; monthly wages, \$492,250; bales of cotton consumed annually, 182,775; production, 831,875,000 yards. The city also contains a woollen mill, two print works, a bleachery, a brass founding and finishing establishment, several iron works and machine shops, producing steam engines, cotton machinery, turbine water wheels, &c., 4 manufactories of cotton thread, 2 of twine and wicking, 2 of files, 6 of carriages, 4 of soap, 1 of soda, 5 of oil, 8 of weavers' reeds and harness, a ship-building establishment, and several planing mills. There are seven national banks, with an aggregate capital of \$2,250,000, and four savings banks, having in October, 1873, 21,190 depositors and deposits to the amount of \$8,891,002 95. The Fall River savings bank, incorporated in 1828, had 11,128 depositors and deposits to the amount of \$5,274,998 09. Fall River is divided into six wards, and is governed by a mayor, a board of aldermen of

one member, and a common council of three members, from each ward. There is a police court, and a police force of about 80 men under the city marshal. In 1872 there were a high school, 29 grammar, 29 primary, and 8 evening schools, having 99 teachers and an average attendance of 4,277 pupils. The total expenditure for school purposes was \$145,477 80, of which \$44,412 46 was for teachers' wages. The public library contains 10,678 volumes. Two daily and two weekly newspapers are published. There are 24 churches, viz.: 3 Baptist, 3 Congregational, 2 Christian, 1 Episcopal, 1 Friends', 5 Methodist, 1 New Jerusalem, 1 Presbyterian, 6 Roman Catholic, and 1 Unitarian.—Fall River, formerly a part of Freetown, was incorporated as a separate town in 1803. Its name was soon after changed to Troy, but in 1834 the old appellation was restored. It received a city charter in 1854, and in 1862 the town of Fall River, Newport co., R. I., with 3,377 inhabitants, was annexed to it.

FALLS, a central county of Texas, intersected by Brazos river; area, 795 sq. m.; pop. in 1870, 9,851, of whom 4,681 were colored. Most of the surface is occupied by rolling prairies, the soil of which is a rich black loam. The river bottoms are still more fertile, and produce good crops of Indian corn and cotton, with plenty of oak, pecan, cedar, cottonwood, and other timber. Limestone underlies a large part of the county, and a vast ledge of it crossing the bed of Brazos river causes the falls from which the county derives its name. The chief productions in 1870 were 408,094 bushels of Indian corn, 81,424 of sweet potatoes, and 14,126 bales of cotton. There were 5,269 horses, 2,405 milch cows, 17,602 other cattle, and 7,406 swine. Capital, Marlin.

FALMOUTH, a parliamentary borough and seaport of Cornwall, England, beautifully situated on the S. W. side of a harbor on the channel, at the mouth of the river Fal, 45 m. S. W. of Plymouth; pop. in 1871, 5,294. It is on a steep acclivity, reaching to the water's edge, and consists mainly of one long narrow street. It has many good stone houses, and a plentiful supply of water in the N. and S. quarters, where the ground is arranged in terraces. The harbor, one of the finest in Great Britain, is formed by the estuary of the Fal. It is 12 to 18 fathoms deep, and can contain 500 vessels. It is defended on the west by Pendennis castle, and on the east by St. Mawes castle, both built by Henry VIII. and improved by Elizabeth. Pendennis castle underwent a long siege by Cromwell, traces of whose encampment near by are still visible. It now contains barracks, storehouses, magazines, &c. Sir Walter Raleigh visited the harbor on his return from the coast of Guiana, and first called attention to its great advantages, which had till then been altogether overlooked. The entrance is about 1 m. wide, and the bay, which runs 6 or 7 m. inland, is a favorite resort of British vessels in time of war. Before the in-

roduction of mail steamers it was the principal station for the Spanish, Portuguese, and American packet service, and carried on an extensive trade with those countries. It exports pitch, which are taken off its coast, tin, and copper, and imports timber, hemp, tallow, rum, sugar, grain, wine, and fruits. It has large ship-building yards, roperies, breweries, and a flourishing trade in maritime supplies. The number of vessels registered as belonging to the port is 150. The royal Cornwall polytechnic society, the first institution of the kind established in England, founded in 1833 for the encouragement of the sciences, art, and industry, meets annually at Falmouth.

FALSE IMPRISONMENT. The jealous watchfulness of the common law of England for the protection and preservation of personal liberty is nowhere proved more distinctly than in the provisions of the law respecting what is technically called false imprisonment. In their extent and fulness they are quite peculiar to that law; and while the principles on which they rest, and some of the rules derived from them, may be discerned even in Saxon times, they have certainly been developed and systematized in later ages, as the worth of personal liberty became more accurately estimated and the means of preserving it better understood. False imprisonment, in the law of England and the United States, may now be defined as any intentional and unlawful restraint of a person. It may be: 1, the restraint or arrest of a person under color of law, by means of an illegal or insufficient process; 2, such restraint or arrest by means of a legal instrument, but at an illegal time, as on Sunday or any other day generally prohibited, or at any time which is illegal and unauthorized in respect to the person restrained; 3, without color or pretence of law, as when one confines another to his room or house without legal authority to do so. False imprisonment may be with force or wholly without force; as if one, without touching another, by words only, or even by gestures only, compels him by fear to abstain from going where he has a right to go, or to go where he wishes not to go and is under no obligation to go. It is false imprisonment to confront a man in the street, and, without touching him, constrain him to arrest his course or change it against his will.—The remedies for false imprisonment are threefold: 1, an action for trespass *vi et armis*, when the party imprisoned may recover not only such damages as are capable of being estimated on the evidence, but such further sum as the jury, in cases where the party had no reason to believe his conduct lawful, may consider proportioned to the character of the wrong; 2, the writ of *habeas corpus* for immediate relief from the restraint; 3, indictment at common law for false imprisonment of any kind, for which the guilty party may be severely punished. In some of the United States there are various statutory provisions respecting certain kinds of false imprisonment.

FALSE PRETENCES. Any one who acquires property by means of false pretences has no legal title to it, and it may be recovered by the party from whom it was thus obtained, and who is still the legal owner. (See FRAUD.) But besides this civil remedy, the statutes of England and of the United States make the obtaining of property by false pretences an indictable offence. The expressions in our state statutes are various; but in general, any one who by means of false pretences, and with a fraudulent design, obtains possession of money, merchandise, goods, or wares of any description, or obtains the signature of another to a deed, note, or other contract or writing for the transfer of property or the payment of money, becomes liable under the statute. It is impossible to define precisely the false pretences which expose one to this punishment. It is obvious that they cannot be slight suggestions which are without foundation, or open and obvious falsehoods by which no man in his senses would be deceived. In the first place, they must be intended to produce an injurious effect; and in the next place, they must be such as would be likely to deceive a person of ordinary discretion, who is to a reasonable extent on his guard. They must relate to existing facts, and not be mere promises of something to be done in the future. If the pretences or misrepresentations are numerous, and most of them are honest, but some one of them is at once material, false, and fraudulent, the offence is committed; and this is so, although the statements which were true exercised the principal influence in obtaining the property for the guilty party, provided it would not have been given him but for the statement also which was false. It may be remarked that no false pretences made after the contract was completed will constitute the offence, even if they were made before the property was delivered, unless the delivery or execution was at first withheld, and then brought about by the false pretences. At common law the nearest provision to this of the modern statutes was one which exposed to indictment and punishment as a cheat a person who obtained possession of money or goods by means of what were called false tokens, by which was meant forged papers, or other counterfeit symbols or evidence of ownership or authority. Language similar to this of the modern statutes is used in some of our statutes, as in those of Pennsylvania. The first statute against false pretences in England was 30 George II., c. 24; and this has been followed by the different states of the Union, more or less exactly. The most common instances of indictments under these statutes are for the obtaining of goods by buyers under false pretences as to their responsibility or resources; and it was mainly to suppress these that the statutes were intended.

FALSEN, Knutsen Magnus, a Norwegian historian, born at Opslo, Sept. 17, 1782, died in Christiania, Jan. 13, 1880. He was a son of

the poet Enevold von Falsen, was educated in Copenhagen, became a lawyer and judge in Norway, and was a member of the constituent diet of Eidsvold (1814), and deputy to the storting (1815-'22). He voluntarily gave up his title of nobility, but became unpopular in 1822, when, as attorney general, he defended such measures of the government as conflicted with his formerly enunciated views. The storting in 1824 withdrew the appropriation for his office, upon which the king appointed him governor of Bergen, and in 1827 he removed to Christiania as justice of the supreme court. His principal work is *Norges Historie* (4 vols., Christiania, 1828-'4).

FALSTER, an island of Denmark, in the Baltic, S. of Seeland, separated from the island of Møen on the northeast by Grøn sound, and from that of Laaland on the west by Guld-borg sound, and forming part of the bailiwick of Maribo; area, including the little island of Hasselø, 181 sq. m.; pop. in 1870, 25,000. In the northeast it is mountainous, and elsewhere entirely flat. On account of its abundant fruits, it is called the orchard of Denmark. Grain, flax, hemp, hops, honey, and wax are the principal products. Cattle, hogs, and poultry abound, and peat, chalk, and building stone are found. The chief town, Nykiøbing, contains a castle and cathedral, and has an active trade; pop. in 1870, 3,645. Originally in possession of Danish nobles, the island passed into that of the royal family, and a number of Danish queens resided in its capital in the 16th and in the early part of the 17th century.

FAMAGOSTA, or *Famagusta* (anc. *Arsinoë*; Turk. *Mausa*), a seaport town of the island of Cyprus, on the E. coast, about 12 m. N. W. of Cape Grego; pop. about 800. It is about two miles in circumference, and is little more than a confused mass of ruins, the ancient streets being choked up and the buildings fallen into decay; but the fortifications erected by the Genoese and Venetians are in a good state of preservation, and the cannon mounted by the latter still defend its walls. Of the 200 churches which it formerly contained, but a few ruined ones remain. The Latin cathedral of St. Nicholas, now a mosque, is a fine specimen of mediæval architecture. In it the Lusignans were crowned kings of Jerusalem, and many interesting monuments are still to be seen in its interior. On the N. side of the town are bomb-proofs and cannon foundries. There are but two gates, one on the south and one opening toward the port. The harbor is narrow and its entrance is shallow, but there is good anchorage before the town in eight fathoms of water. Without the walls is the suburb of Varoskia, which contains most of the population. The surrounding country is bleak and barren. About 5 m. to the north are the ruins of ancient Salamis.—The original city was one of those built by Ptolemy Philadelphus in honor of his sister Arsinoë. After the battle of Actium it was called by Augustus

Fama Augusta. It was of great importance during the crusades, and it was there that Guy de Lusignan received the crown of Cyprus in 1191 from Richard I. of England. It was taken by the Genoese in 1373, and in 1489 by the Venetians, under whom it became a rich and powerful city. In 1571 it fell into the hands of the Turks, after a siege of four months, in which it was nearly destroyed; and in 1785 an earthquake completed its ruin.

FAN, an implement used to produce coolness by agitating the air. Its origin is traced to remote antiquity, and is ascribed by some historians to Kan-si, daughter of a Chinese mandarin. On the walls of the tombs at Thebes, the king is represented surrounded by his fan-bearers, who bore the instruments as standards in war, while in times of peace they waited upon the monarch in the temple, refreshing him with the fans, and at the same time driving away insects from the sacred offerings. The fashion spread from Persia to Asia Minor, and in Greece we find traces of fans as early as 500 B. C. The wings of a bird joined laterally and fastened to a delicate handle constituted a most beautiful fan. The fan of the priest of Isis, when the worship of that divinity began to prevail in Greece, was semicircular, made of feathers of different lengths, pointed at the top, and waved by a female slave. In one of the tragedies of Euripides a eunuch is introduced, who says that, in accordance with Phrygian custom, he had used his fan to protect Helen against the effects of the heat. In Rome fans became popular among the ladies, and at dinner parties slaves with fans stood behind the guests. The Roman poets, Ovid, Terence, and Propertius, frequently allude to their use, and the pictures on the ancient vases also indicate the wide prevalence of the fashion. In the middle ages fans made of eagle or peacock feathers, in various forms, and fastened with a handle of gold, silver, or ivory, were a lucrative article of trade in the Levantine markets, whence they were exported to Venice and other Italian cities. Catharine de' Medici introduced into France fans which could be folded in the manner of those of the present day. Having been favorably received by the court of Henry II., they became objects of great luxury during the reigns of Louis XIV. and Louis XV. No toilet was considered complete without a fan, the cost of which frequently exceeded \$70. Picturesque landscapes, the most exquisite paper of China, the most elegant taffeta of Florence, precious stones and diamonds, all in turn were put in requisition to enhance the appearance and the value of the fan. Manufacturers of fans soon became numerous in Paris; and previous to 1673, when a charter was granted to them by Louis XIV., they had organized themselves into a corporation. In England, fans were in fashion in the time of Henry VIII. In Shakespeare's "Merry Wives of Windsor" an allusion to fans is made by Falstaff to Pistol. A superb fan set

with diamonds was presented to Queen Elizabeth on New Year's day. Among the articles received by Cortes from Montezuma were five fans of variegated feathers, four of them with 10 and one with 13 rods embossed with gold, and one fan, also with variegated featherwork, with 37 rods plated with gold. In Spain at an early day fans were special favorites with ladies, and the Spanish lady, as well as the ladies of Spanish extraction in the new world, are inimitable in their management (*manejo*) of the fan (*abanico*.) They carry on conversations with it, and a book might be written to explain the complicated code of signals by which they express their feelings with the fan.—The best and cheapest lacquered fans are produced in China. Those made of ivory, bone, and feathers are destined chiefly for the European and American markets. The fans which the Chinese use are of polished or japanned bamboo, covered with paper, and vary in price from 20 to 30 cents a dozen. The state fan which is used on great occasions in China and India is precisely of the same semicircular form and pointed top which was in fashion among the ancient Greeks. In Japan the fan is to be seen on all occasions, among all classes of society, and in the hands of men, women, and children. Where the European takes off his hat in token of politeness, the Japanese performs the same courtesy by waving his fan. In the schools diligent scholars receive fans in reward for their zeal. A gentleman, in giving alms to a beggar, puts the money upon his fan. When a criminal of rank is sentenced to death, his doom is proclaimed to him by presenting him with a fan, and his head is taken off while he bows and stretches out his hand to receive the fatal gift. Japanese fans, generally ornamented with grotesque pictures, are exported in large quantities to the United States, where they are as popular as those of China for their cheapness and neatness.—Fans were used for allegorical purposes in the mythology of Greece, and the Egyptian custom of employing them in temples and for religious purposes has also been perpetuated in the ritual of the modern Greek church, which places a fan in the hands of its deacons. They are used to this day in Rome on public occasions, especially at the *festa di cattedra*, when the pope is escorted by two men who carry feather fans with ivory handles, but do not use them.—Next to China and Japan, France is most celebrated for the manufacture of fans, but beautiful fans are also made in the United States, in England, at Brussels, Geneva, Vienna, and at various other places. The manufacture in France presents an interesting instance of the subdivision of labor, 20 different processes being required to produce a fan which sells for less than three cents, as well as one worth several thousand francs. This industry gives employment to thousands of persons, and its aggregate value for Paris alone is estimated at 7,000,000 francs annually. In France, the fan is occasionally used by gentlemen at the

theatres, having first appeared on a warm summer evening of 1828, during the representation of *Corisandre* at the comic opera. Hence the name of *corisandre* applied in France to fans used by gentlemen.

FANARIOTES, or **Phanariotes**, the Greeks who reside in the Fanar or Phanar district of Constantinople, whose ancestors had escaped the fury of the Turkish conquerors after the capture of that city by Mohammed II. (1453). Originally employed as translators of public documents and as secretaries and stewards of distinguished personages, they gradually acquired by their wealth, as well as by their abilities and intrigues, great political, financial, and social importance in Turkey. The office of dragoman of the divan was for the first time intrusted to a Greek in the 17th century, under Mohammed IV., and has since been uniformly conferred upon Fanariotes. Most of the hospodars of Moldavia and Wallachia from the latter part of the 17th century to the beginning of the 19th were also members of Fanariote families (Callimachi, Cantacuzene, Cantemir, Ducas, Karadja, Musuri, Sutzo, Ypsilanti, &c.). The Fanariotes were the principal bankers of Constantinople, and as such dispensers of an extensive patronage in the bestowal of public offices.

FANDANGO, the oldest national dance of Spain, especially of Andalusia. Some suppose it to have been introduced by the Moors; others say the Moors found the dance already established, and trace its origin to the most ancient times. It is danced in three-four time by one couple only, usually to the accompaniment of the guitar, and occasionally also of the tambourine, the dancers beating time with castanets and the spectators by clapping their hands. The Andalusian villagers dance it almost every evening, and always on Sunday. The dancers and their friends sing improvised couplets; and the lady offers her cheek to the men present after each dance, and allows herself to be embraced by all of them. The fandango is described as vivacious, graceful, and voluptuous. Repeated efforts of the clergy to suppress the dance have proved inadequate to overcome its popularity among the peasantry.

FANEUIL, **Peter**, the founder of Faneuil hall in Boston, born of a French Huguenot family in New Rochelle, N. Y., in 1700, died in Boston, March 8, 1743. He became a merchant in Boston, and in 1740, after the project of erecting a public market house in Boston had been discussed for some years, he offered at a public meeting to build a suitable edifice at his own cost as a gift to the town; but so strong was the opposition to market houses that, although a vote of thanks was passed unanimously, the offer was accepted by a majority of only seven. The building was commenced in Dock square in September of the same year, and finished in two years. It comprised a market house on the ground floor, and a town hall with other rooms (an addition to the original plan) over it. In 1761 it was destroyed by fire; in 1763 it

was rebuilt by the town; and in 1775, during the British occupation of Boston, it was used for a theatre. In 1805 it was enlarged by the addition of another story, and was increased in width. During the revolutionary period it was the usual place of meeting of the patriots, from which it gained the name of the cradle of American liberty.

FANFANI, Pietro, an Italian philologist and novelist, born at Pistoja, Tuscany, in 1817. He studied medicine, but gave his attention chiefly to philology, and in 1847 founded at Pistoja a magazine relating to that science (*Ricordi filologici*). The next year he enlisted in the war against the Austrians, and fell into their hands. After his release he published (1849) critical comments on the dictionary of the academy della Crusca, which involved him in an acrimonious and successful controversy with that institution. Gioberti obtained employment for him in the ministry of education at Turin. Subsequently he held an office under the Tuscan government at Florence, where in 1859 he became director of the famous Marucellian library, which post he still held in 1873. He has published *Etruria, studi di filologia, di letteratura, di pubblica istruzione e di belle arti* (2 vols., Florence, 1851-'2); *Il Borghini, giornale di filologia e di lettere italiane* (3 vols., 1863-'5); *Vocabolario dell' uso toscano* (2 vols., 1868); *Commento alla Divina Commedia d'Anonimo Fiorentino del secolo XIV.* (3 vols., Bologna, 1866); and *Lettere precettive di eccellenti scrittori* (2d ed., 1871). Among his other writings are: *La Paolina*, a novel in the Florentine dialect (2d ed., 1868); *Una bambola*, a story for children (1869); and *Cecco d'Ascoli*, a historical narrative of the 14th century (1870; Leipsic, 1871).

FANNIERE, François Auguste and François Joseph, French engravers and carvers, brothers, the former born at Longwy in 1818, and the latter in 1822. Adopting the profession of their father, they received with the assistance of their grandfather, M. Fauconnier, an excellent training, and reached by their joint labors a greater eminence in carving and embossing on metals than any artist since Benvenuto Cellini. They were rewarded with prizes at the exposition of 1849, and the elder brother, who produced large works in gold with bass reliefs at that of 1855, was made chevalier of the legion of honor. Their subsequent joint masterpieces are two shields representing incidents from *Orlando furioso*, executed for the duke de Luynes.

FANNIN. I. A N. W. county of Georgia, bordering on Tennessee and North Carolina; area, 425 sq. m.; pop. in 1870, 5,429, of whom 114 were colored. The surface is mountainous. The chief productions in 1870 were 3,947 bushels of wheat, 7,027 of rye, 113,754 of Indian corn, and 6,210 of oats. There were 3,472 cattle, 5,123 sheep, and 7,571 swine. Capital, Morganton. II. A N. E. county of Texas, separated from the Indian territory

by Red river, and drained by Sulphur fork of that stream, and by Bois d'Arc creek; area, about 800 sq. m.; pop. in 1870, 13,207, of whom 2,484 were colored. It consists principally of highly fertile prairie lands. The chief productions in 1870 were 17,648 bushels of wheat, 476,563 of Indian corn, 53,472 of oats, 23,193 of sweet potatoes, 123,835 lbs. of butter, and 5,699 bales of cotton. There were 7,041 horses, 20,486 cattle, 5,681 sheep, and 18,845 swine. Capital, Bonham.

FANNIN, James W., an officer of the Texan revolution, born in North Carolina, killed at Goliad, Texas, March 27, 1836. He was a captain in the Texan service in 1835, and on Oct. 28, at the head of 90 men, with Capt. Bowie, defeated a superior Mexican force near Bexar. Gen. Houston soon afterward made him colonel of artillery and inspector general. In January, 1836, he set out to reinforce Dr. James Grant, commanding an unauthorized expedition to Matamoros. At Refugio he learned the destruction of Grant's party and fell back to Goliad, which he put in a state of defence. But by Houston's order he marched toward Victoria, and on March 19 was attacked at the Coleta river by a Mexican force under Gen. Urrea. Throwing up a breastwork of wagons, baggage, and earth, the Texans defended themselves with spirit until night interrupted the fighting, Col. Fannin being among the wounded. The battle was renewed on the 20th, but the Mexicans having received a reinforcement of 500 men, with artillery, a capitulation was signed, by which it was agreed that the Texans should be treated as prisoners of war, and as soon as possible sent to the United States. Having surrendered their arms, they were taken to Goliad, where on the 26th an order was received from Santa Anna requiring them to be shot. At daybreak the next morning the prisoners, 357 in number (the four physicians and their four assistants being spared), were marched out under various pretexts, and fired upon in divisions. Fannin was killed last. Many attempted to escape, and were cut down by the cavalry, but 27 are believed to have eluded pursuit.

FANNING, David, a tory and freebooter of North Carolina during the war of the revolution, born of low parentage in Wake co., N. C., about 1756, died in Digby, Nova Scotia, in 1825. He seems to have been a carpenter, but led a vagabond life, trafficking with the Indians, and being connected for some time with the notorious Col. McGirth on the Pedee. When Wilmington was occupied by the British in 1781, Fanning, having been robbed by a party of men who called themselves whigs, attached himself to the tories, collected a small band of desperadoes, and scoured the country, committing frightful atrocities, but doing such good service to the British that Major Craig rewarded him with the royal uniform, and gave him a commission as lieutenant colonel in the militia. He captured many prominent whigs, hanging

those who had incurred his personal resentment upon the nearest tree. His name was a terror to the whole country; he was excepted in every treaty and enactment made in favor of the royalists, and was one of the three persons excluded by name from the benefits of the general "act of pardon and oblivion" of offences committed during the revolution. On the other hand, his romantic mode of life and personal daring, displayed many times in battle, drew around him numerous followers, whom he disciplined with great strictness. He is said to have commanded at one time 200 or 300 men. When the whigs began to gain the ascendancy in North Carolina, he went to Florida, and afterward to St. John's, N. B., where he assumed a respectable deportment, and became member of the assembly. About 1800 he was sentenced to be hanged for rape, but escaped, and was afterward pardoned.

FANO, a seaport of central Italy, in the province of Pesaro, on the Adriatic, near the mouth of the Metauro, 30 m. N. W. of Ancona; pop. about 20,000. It is surrounded by old walls, built by the emperor Augustus, in whose honor was erected here a triumphal arch of white marble, which is still standing. Few cities of central Italy surpass it in artistic treasures or richness of the surrounding soil and scenery. The cathedral is adorned with 16 frescoes by Domenichino, representing events in the life of the Virgin. Many of the 18 other churches, and several public buildings and private mansions, contain paintings by the great Italian masters, marbles, statues, and fine monuments. It is the seat of a bishop, and has a lyceum, a gymnasium, a technical school, a public library, and a theatre considered one of the finest in Italy. The manufactures are chiefly of silk stuffs and twist, and the trade is in corn, oil, &c. The port was once much frequented, but is now choked up with sand, and visited only by small coasting vessels.—Fano occupies the site of the ancient Fanum Fortuna, so called from a temple of Fortune built by the Romans, and commemorative of their victory over Hasdrubal on the river Metaurna, in the second Punic war. It was the scene of a victory by Narses over the Goths under Totila. In 1511 Pope Julius II. established here the first printing press in Europe with movable Arabic types.

FANSHAWE, Sir Richard, an English poet and diplomatist, born at Ware Park, Hertfordshire, in June, 1608, died in Madrid, June 16, 1686. He studied in Jesus college, Cambridge, and in the Inner Temple. He then went abroad to study manners and languages, and on his return home became secretary to the embassy at Madrid, where he remained till 1638. On the outbreak of the civil war he declared for the crown, and was made secretary to the prince of Wales. In 1648 he was appointed treasurer to the navy under Prince Rupert, and two years later he was made a baronet, and sent to Madrid to implore the assistance of Spain.

He was taken prisoner at the battle of Worcester, but being released passed several years in retirement, translating the "Lusiad" of Camoens, and upon the death of Cromwell joined Charles II. at Breda. He was appointed master of requests and Latin secretary to the exiled monarch, and after the restoration was elected to parliament, and was sent upon diplomatic missions to Madrid and Lisbon, negotiating the marriage of Charles with the infanta Catharine of Portugal. Besides his version of the "Lusiad" (1655), he translated the *Pastor fido* of Guarini and the odes of Horace, and wrote a few short original poems. The "Original Letters and Negotiations of Sir Richard Fanshawe, the Earl of Sandwich, the Earl of Sunderland, and Sir William Godolphin" (8vo, London, 1724) is a valuable contribution to history. The "Memoirs of Lady Fanshawe," written by herself, with extracts from the correspondence of her husband, edited by Sir N. H. Nicolas, was published in London in 1880.

FANTEE, a country of the Gold Coast, W. Africa, bounded N. W. and N. by Assin and Dubbin, E. by Aquapim, S. by the gulf of Guinea, and W. by Wassaw, lying near lat. 5° 30' N., lon. 1° W. Capital, Mankasim. It is watered by several rivers, is said to be fertile and populous, and has several important trading stations along its coast. The inhabitants are remarkably cleanly, are more muscular than the Ashantees, and may be distinguished from other

A Fantee Woman.

African tribes by small scarifications on the back of the neck and the upper part of the cheek bones. Their heads are high and round, and their color is a dull brownish black. They have long faces with jaws protruding to an unusual extent, flat noses, thick lips, and very large ears. The dress of both sexes consists

of a single piece of cloth wrapped loosely around the body. They pay a nominal obedience to chiefs called caboceers, besides whom every village has its local magistrate. They formerly governed or influenced a seaboard district extending about 100 m. along the coast. About 1807, becoming involved in a war with the king of Ashantee, they obtained the active interference of the English, who had a small fort in Anamboo, one of their towns; but this alliance, while it plunged the British into a disastrous quarrel, proved of no benefit to the Fantees, whose territory after a long struggle was occupied by the victorious Ashantees. In 1823 the Fantees, encouraged by the British, rebelled, but were again subdued, the British being defeated by the Ashantees, and their commander, Sir Charles McCarthy, captured and put to death. In 1826, however, the British defeated the Ashantees and compelled them to retire to their own territories. From that time for nearly half a century the Fantees were unmolested under British protection. But in 1872 the Dutch possessions on the Gold Coast were transferred by treaty to Great Britain, and in 1873 Koffee Calcalli, king of Ashantee, complaining that some of the stipulations of his treaties with the Dutch had been violated by the British, declared war against them, overran and ravaged the Fantee territories, and in September was threatening Cape Coast Castle with a numerous army. The British government, holding itself bound to protect its allies, the Fantees, sent a powerful force to the Gold Coast under command of Gen. Wolseley, who in November was advancing toward Coomassie, the Ashantee capital, driving before him the army of Koffee Calcalli, which was estimated to be about 40,000 strong. (See GOLD COAST.)

FANTI, Manfredo, an Italian general, born in Carpi, Modena, about 1810, died April 6, 1865. He took part in 1831 in the unsuccessful insurrection against the Austrians, served afterward in the French army, passed into the royal service of Spain in 1835, and returned at the outbreak of the revolution of 1848 to Italy, where he became a major general in the Sardinian army. In 1855 he commanded one of the four brigades sent to the Crimea, and in the war of 1859 took part as lieutenant general in the battles of Magenta and Solferino. In January, 1860, he accepted the portfolios of war and of marine in the cabinet of Count Cavour, in February became senator, and in September commanded the expedition against the Papal States. He left the cabinet in 1861, and in 1862 became commandant general of the military department of Florence.

FARADAY, Michael, an English chemist and natural philosopher, born at Newington, Surrey, Sept. 22, 1791, died at Hampton Court, Aug. 25, 1867. His father was a blacksmith, of feeble health, and very poor. A short distance from their home in London was a bookseller's and bookbinder's shop kept by George

Riebau, and there Faraday went, when 13 years of age, as an errand boy, on trial, for one year. It was a part of his duty at first to carry round the newspapers that were lent out by his master. At the end of a year he became an apprentice to Riebau, the indentures to continue seven years. "In consideration of his faithful service," no premium was given to the master. Faraday says of himself: "While an apprentice I loved to read the scientific books which were under my hands, and among them delighted in Marcet's 'Conversations on Chemistry' and the electrical treatises in the 'Encyclopædia Britannica.' I made such simple experiments as could be defrayed in their expense by a few pence per week, and also constructed an electrical machine, first with a glass vial, and afterward with a real cylinder, as well as other electrical apparatus of a corresponding kind." "My master," he says, "allowed me to go occasionally on an evening to hear the lectures delivered by Mr. Tatum on natural philosophy at his house, 53 Dorset street. The charge was one shilling per lecture, and my brother Robert (who was a blacksmith) made me a present of the money for several." That he might be able to illustrate scientific lectures, he took lessons in drawing of a Mr. Masquiere, who also lent him Taylor's "Perspective," "which I studied closely," he says, "copied all the drawings, and made some other simple ones." Among the notes Faraday has left of his own life occurs the following: "During my apprenticeship I had the good fortune, through the kindness of Mr. Dance, who was a customer of my master's shop, and also a member of the royal institution, to hear four of the last lectures of Sir Humphry Davy in that locality. Of these I made notes, and then wrote out the lectures in a fuller form, interspersing them with such drawings as I could make. I wrote to Sir Humphry Davy, sending as a proof of my earnestness the notes I had taken." He was invited by Davy to call upon him, which resulted in his appointment as assistant in the laboratory of the royal institution, whither he went in March, 1813. In October of the same year he went with Davy abroad, as amanuensis and assistant in experiments. The tour lasted only a year and a half, but was full of the most vivid interest to young Faraday. In the latter part of April, 1815, they returned to England, and Faraday, now 23 years of age, resumed his place as assistant in the laboratory, and was also made assistant in the mineralogical collection, and superintendent of the apparatus, at a salary of 30 shillings per week. During the year 1816 he gave seven lectures before the "City Philosophical Society:" 1, on the general properties of matter; 2, on the attraction of cohesion; 3, on chemical affinity; 4, on radiant matter; 5, 6, and 7, on oxygen, chlorine, iodine, fluorine, hydrogen, and nitrogen. His first paper appeared in the "Quarterly Journal of Sciences," and was an analysis of some caustic lime from Tuscany, which

had been sent to Davy by the duchess of Montrose. In 1817 he gave a second course of lectures before the city philosophical society, at the tenth of which, on carbon, he used notes for the first time, instead of reading his lectures. In 1818 he investigated the subject of sounding flames, showing that they were not dependent, as De la Rive had supposed, upon the sudden expansion and condensation of vapor, but that they were connected with musical vibrations produced in a manner similar to the tones of a flute or of an organ pipe. He obtained the sounds as well when using a flame of carbonic oxide gas as when using one of hydrogen. In 1819 he made a tour on foot through Wales, and kept a journal in which there are many passages manifesting his intense love of nature and his vivid powers of description. In 1820 he published a paper on two new compounds of chlorine and carbon, and on a compound of iodine, carbon, and hydrogen. It was read before the royal society, and was the first which was published in the "Philosophical Transactions." On June 12, 1821, he was married to Miss Sarah Barnard, a daughter of an elder in the Sandemanian church, and, having obtained leave, took his wife to reside at the royal institution, where they remained until they moved to the house assigned them in Hampton Court by the queen in 1858. A month after his marriage he became a member of the Sandemanian church. His ideas of religion are indicated by the following quotation from a lecture delivered on medical education in 1854: "High as man is placed above the creatures around him, there is a higher and far more exalted position within his view; and the ways are infinite in which he occupies his thoughts about his fears, or hopes, or expectations of a future life. I believe that the truth of the future cannot be brought to his knowledge by any exertion of his mental powers, however exalted they may be; that it is made known to him by other teaching than his own, and is received through simple belief of the testimony given. Let no one suppose for a moment that the self-education I am about to commend, in respect to the things of this life, extends to any consideration of the hope set before us, as if man by reasoning could find out God." In 1821 there occurred the only unpleasant circumstance that seems ever to have been connected with his life. Dr. Wollaston was the first person to entertain the idea of causing a wire to revolve around a magnet, or upon its own axis, and in a visit to Davy at the royal institution made some experiments and conversed upon the subject, during a part of which time Faraday was present. It greatly excited his interest, and he could not refrain from making experiments, the result of which was that in the months of July, August, and September he wrote a history of the progress of electro-magnetism, which was published in the "Annals of Philosophy." In the latter

month he made the discovery of the rotation of a wire in a voltaic circuit round a magnet, and of a magnet round a wire. He says: "I did not realize Dr. Wollaston's expectation of the rotation of the electro-magnetic wire round its axis; that fact was discovered by Ampère at a later date." These experiments and publications of Faraday created considerable feeling, so much that the matter was discussed two years afterward, when he was proposed as a member of the royal society. He was charged with trespassing upon the province of another, and with using another's implements in cultivating the field; but his unblemished character in all other relations, and the great discoveries which he made in this abstruse department of electro-chemistry and electro-magnetism, at last removed all tinge of imputation of wrong intention; and long before he closed his labors all men of science were heartily glad that Faraday had followed his inclinations. About the year 1822 and for some time after he investigated the subject of the liquefaction of vapors and gases, and in 1823 examined a substance which had been regarded as pure chlorine, but which Davy in 1810 had proved to be a hydrate. Faraday first analyzed this hydrate, and then at the instance of Davy subjected it to the action of its own pressure on being heated in a strong sealed tube, by which means he obtained liquid chlorine. Extending his experiments to other gases, he succeeded in reducing a number of them to a liquid state. His first memoir was read before the royal society April 10, 1823, and the second on Dec. 19, 1844. Prof. Tyndall says that while making his first series of experiments an explosion occurred by which 13 pieces of glass were driven into his eyes. In 1825 he published a paper in the "Philosophical Transactions" on new compounds of carbon and hydrogen, in which he announced the discovery of benzole. But his mind continually reverted from chemistry to physics, and in 1826 he was again engaged upon the subject of vaporization, in which he came to the conclusion that a limit exists, and that our atmosphere does not contain the vapors of what are usually denominated the fixed constituents of the earth's crust. During the year he had ten papers in the "Quarterly Journal," one of the principal being on pure caoutchouc, his analysis of which is given in the article on that substance in this work. In 1825 Faraday was appointed with Sir John Herschel and Mr. Dolland on a committee to examine the manufacture of glass for optical purposes. Their experiments continued for four years, when Faraday delivered his first Bakerian lecture "On the Manufacture of Glass for Optical Purposes." This paper required three successive sittings of the royal society, and although the investigation had not much immediate practical use, it led to other and very important discoveries. In 1831 he published a paper on vibrating surfaces, in which he solved the

problem of the cause of the collection of lycopodium seeds and other light bodies upon the vibrating parts of sounding plates, instead of upon the nodal lines where sand is collected, by showing that the light bodies are prevented from settling on the nodal lines by minute whirlwinds formed in the air over the vibrating parts. In 1827 he published his "Chemical Manipulations" (1 vol. 8vo; 2d ed., 1830; 3d ed., 1842). In April of this year he gave his first course of six lectures before the royal institution upon the atmosphere, gases, vapor, chemical affinity, definite proportions, flame, galvanism, and magnetism as evolved by electricity. Between February and May he delivered twelve lectures at the London institution on the subject of chemical manipulation. In December he commenced a course of lectures on chemistry to juvenile audiences. His power of imparting the elementary principles of science to youthful minds was wonderful, owing not only to the logical simplicity of his mind, but to his happy choice of and manner of making experiments. These courses of lectures succeeded each other from year to year, and it was also his habit to deliver popular lectures on Friday evenings at the royal institution throughout nearly his whole scientific career. In 1829 he was appointed lecturer on chemistry in the royal academy at Woolwich. In 1831 he commenced his celebrated series of electrical researches, which were continued through a great number of years. He investigated the induction of electric currents and the evolution of electricity from magnetism; and although Oersted was the discoverer of electromagnetism, and Ampère its expounder, Faraday made the science of magneto-electricity substantially what it is at the present day. In this year he also began to develop his theory of lines of magnetic force. In 1833 he was appointed the first Fullerian professor of chemistry at the royal institution, and during the same and the succeeding year he studied the laws of electro-chemical decomposition, and applied the word electrode in place of pole to the conductors connected with a decomposing cell, the fluid in which he called an electrolyte, and the act of its decomposition electrolysis. The positive electrode he called the anode, and the negative the cathode, and also applied the terms anions and cations to the chemical elements of the electrolytes which pass respectively to the anode and cathode. He now applied himself to the determination of electric quantity, and for this purpose devised his voltameter, by which he showed that the amount of electricity generated in a voltaic battery depends upon the amount of chemical decomposition, thus establishing the doctrine of "definite electro-chemical decomposition." He investigated the contact theory of Volta, and in doing so developed the ideas which he always afterward entertained on the conservation of force, illustrating the fallacy of the contact theory of galvanism by showing that if true a

force could be produced without drawing its supply from any consuming source. His first great paper on frictional electricity was sent to the royal society Nov. 30, 1837. In his investigation of this subject he developed his inductive theory of electricity, and by numerous memorable experiments illustrated the "specific inductive capacity" of dielectrics, in which he supposed the molecules of the dielectric to form a chain of communication between the inducing and the induced body. He also, during the years 1836-'8, made experiments for the Trinity house on electric light for lighthouses, a subject which again in the latter part of his life engaged much of his attention. In 1840 he was elected an elder in the Sandemanian church, but held the office only for 3½ years, during which period, when in London, he preached on alternate Sundays. His great labors had impaired his health, and in 1841 he went with his wife to Switzerland, spending much of the time at Interlaken and at the falls of Giessbach, returning at the end of September in the same year. In 1842 he made experiments upon the generation of electricity by steam, prompted thereto by the invention of the celebrated hydro-electric machine of Sir William Armstrong, and showed that it was caused by friction, and not by vaporization, as had been supposed. He performed very little laboratory work till the end of 1844, indulging in the mean time in needful rest. In the beginning of 1845 he made a second series of experiments on the condensation of gases, and about the first of September began the investigation of the magnetic relations of light, which led him to the discovery of the peculiar phenomena of magnecrystalline action. In November he announced his discovery of the "Magnetization of Light and the Illumination of the Lines of Magnetic Force." Whatever doubt there may be as to the soundness of his theory in every particular, his paper is full of the profoundest thought. "I have long," he says, "held an opinion almost amounting to a conviction, in common I believe with many other lovers of natural knowledge, that the various forms under which the forces of matter are made manifest have one common origin; in other words, are so directly related and mutually dependent, that they are convertible, as it were, into one another, and possess equivalents of power in their action." He always held that the theory of gravitation, not as it existed in the mind of Newton, but as commonly understood, embraced an absurdity, by supposing that when the manifestation of attraction between two bodies decreased in proportion to the square of their distance from each other, an equivalent of energy was lost; thus denying the doctrine of "conservation of force," which he considered as established. In December of the same year he published a memoir addressed to the royal society on the "Magnetic Condition of all Matter," in which he discussed the phenomena presented by diamag-

netic bodies, or such as are repelled by the poles of a magnet instead of being attracted, like iron or other paramagnetic bodies, as he termed them. Between this time and 1851 he was much occupied with the magnetic condition of gases, finding, among other facts, oxygen to be powerfully paramagnetic. Among the papers published is one on the diamagnetic condition of flame and gases in the "Philosophical Magazine" for December, 1847, and two elaborate memoirs on atmospheric magnetism sent to the royal society on Oct. 9 and Nov. 19, 1850. He applies his theory of the lines of magnetic force to the solution of the cause of the distribution of magnetism in the earth's atmosphere, and of annual and diurnal variations; and although it has been found that the variation in the declination of the magnetic needle is connected with solar spots, it can scarcely be doubted, as Tyndall remarks, "that a body so magnetic as oxygen, swathing the earth and subject to variations of temperature, diurnal and annual, must affect the manifestations of terrestrial magnetism." Faraday was opposed to the atomic theory, and it is very difficult, perhaps impossible, to comprehend his idea of the subject. In the place of an atom as a particle of matter he substituted a point or centre of force, and connected points of force with lines of force. He says: "This view of the constitution of matter would seem to involve necessarily the conclusion that matter fills all space, or at least all space to which gravitation extends; for gravitation is a property of matter dependent on a certain force, and it is this force which constitutes the matter. In that view matter is not mutually penetrable; but each atom extends, so to say, throughout the whole of the solar system, yet always retaining its own centre of force." In 1853, at the request of many friends, he was induced to investigate the phenomena of "table-turning," and he prepared apparatus with which to test the reality of the phenomena in question. The investigations were conducted with great care, but he discovered no manifestations of any of the forces, natural or supernatural, which had been suggested as possibly concerned in the phenomena. In 1854 he made a series of experiments connected with submarine telegraphy, which were of great value. In 1855 he brought his experimental researches on electricity to a close, having followed them, along with his other investigations, during a quarter of a century. "The record of this work which he has left in his manuscripts and republished in his three volumes of 'Electrical Researches' will ever remain," says his biographer, Dr. Bence Jones, "as his noblest monument: full of genius in the conception; full of finished and most accurate work in the execution; in quantity so vast that it seems impossible that one man could have done so much. Lastly, the circumstances under which this work was done were those of penury. During a great part of these 26 years the royal institu-

tion was kept alive by the lectures which Faraday gave for it. He had no grant from the royal society, and throughout almost the whole of this time the fixed income which the institution could afford to give him was £100 a year, to which the Fullerian professorship added nearly £100 more." In 1856 he was again engaged in experimenting for the Trinity house with electric light for lighthouses, and it is thought that his frequent journeys and night excursions in the channel during the winter, when he was 70 years of age, were the remote causes of his last illness. In 1858 the queen assigned him a house in Hampton Court. In 1860 he resumed his eldership in the Sandemanian church, and held it for the same period as before, resigning in consequence of not being able conscientiously to perform the duties of the office. On June 20, 1862, he gave his last Friday evening lecture, which was on the subject of gas furnaces; in the notes for the lecture he mentions his loss of memory. He was the "prince of popular lecturers," and drew crowds from the theatres to the lecture room of the royal institution on Friday evenings. It was here that he appeared in his glory, absorbed and earnest as a child over his toys, repeating his experiments, in which none were more interested than the lecturer himself. His facility in experimenting was a gift of genius, and his lectures to children are said to have been the most perfect examples of extemporaneous speaking. He was an honorary member of 72 societies, in almost every part of the world. Besides his voluminous manuscripts, papers in the "Philosophical Transactions," and journals, the following works have been published: "Chemical Manipulations" (1827); "Researches in Electricity" (1831-'55); "Lectures on Non-Metallic Elements" (1853); "Researches in Chemistry and Physics" (1859); "Lectures on the Forces of Matter" (1860); and "Lectures on the Chemical History of a Candle" (1861). The chief biographies of Faraday are: a small memoir by Dr. J. H. Gladstone; "Faraday as a Discoverer," by Prof. Tyndall (1868); and "Life and Letters of Faraday," by Dr. Bence Jones (1869).

FAREADIZATION, a term applied to the production of induced currents of electricity, and particularly their employment in electro-therapeutics. The generation of this form of electricity was discovered by Faraday in 1831, and is produced by suddenly magnetizing and demagnetizing a soft bar of iron, or interrupting the flow of the galvanic current through a helix, around which bar or helix a secondary coil of wire is placed. Secondary currents are induced in the latter at every interruption of the galvanic or magnetic force. (See GALVANISM, and MAGNETO-ELECTRICITY.)

FAREHAM, a market town of Hampshire, England, a station on the Southwestern railway, on slightly elevated ground, at the head of a short arm of the sea, 5 m. N. W. of Portsmouth; pop. in 1871, 7,023. It contains a

handsome parish church, and Independent and Wesleyan Methodist churches, free schools, and a hall for a philosophical institution. Ship building was once actively carried on, but has declined. Earthenware, bricks, and terra cotta are manufactured in large quantities, and the latter is largely exported. There is also a considerable trade in grain, canvas, rope, and timber. Fareham is a resort for sea bathing.

FAREL, Guillaume, a French reformer, born near Gap, in Dauphiny, in 1489, died in Neufchâtel, Sept. 13, 1565. While studying at Paris he embraced the new doctrines, and went with his friend Lefèvre d'Étaples to Meaux, where he began to preach. He returned to Paris in 1523, went to Basel the next year, became intimate with Zwingli, Haller, Grebel, and other reformers, quarrelled with Erasmus, and was banished from Basel, all within a few weeks, and then retired to Strasburg, where he was intimate with Bucer. Preaching afterward at Montbéliard and other places, his intemperate zeal drew him into many troubles. One day he interrupted a procession in honor of St. Anthony by snatching the statue of the saint and throwing it into the river. To escape the consequences he fled, and travelled in Alsace and Switzerland. In 1527 he went to Aigle and taught school under an assumed name. In 1532, with Antoine Saunier, he represented the reformed churches in the synod convened by the Vaudois of Piedmont at Chanforans, and on his return was invited to a conference with the Catholics at Geneva, where the controversy became stormy, blows were exchanged, and the magistrates had to interfere. He was ordered to leave the city, returned in 1533, was again banished, came back in 1534 with letters from the signiory of Bern, and in 1536 persuaded Calvin to aid him in the organization of the reformed church at Geneva. The party of "Libertines" gaining the upper hand in the election of 1538, Farel and Calvin were banished. Farel went to Strasburg, and organized the Protestants there amid much opposition. In March, 1543, a body of troops under Claude de Guise fell upon a congregation gathered around him at Gorze in France. Farel was wounded, and narrowly escaped with his life. He then settled as pastor at Neufchâtel. In 1557 he was sent to the Protestant princes of Germany to ask their assistance for the Vaudois, and soon after he incurred the displeasure of Calvin and others by marrying a young girl. In 1561 he preached at Gap with all the violence of his youth, and was thrown into prison, from which his followers released him, letting him down from the rampart in a basket. Farel was a fine scholar and excited great admiration by the brilliancy of his oratory. His writings were numerous, but mostly of temporary interest.

FARIA Y SOUSA, Manoel de, a Portuguese and Spanish historian and poet, born in Portugal, March 18, 1590, died in Madrid, June 8, 1649. He was a son of Amador Perez de Erro, and

assumed the name of his mother, who belonged to the ancient Portuguese Faria family. He was incited to poetical composition by his admiration for Albania, as he called Catharina Machado, who became his wife. After his marriage he settled in Madrid, and from 1630 to 1634 he was special envoy to Rome. On his return he was placed for some time under arrest, the pagan allusions and inferences in his *Comentarios sobre la Lusiada* (2 vols., Madrid, 1639) having given offence to the inquisition, though he regarded himself as a devout Roman Catholic. His subsequent effusions, collected under the title of *Fuente de Aganipe* (4 vols., Madrid, 1644-'6), are in Spanish, excepting 200 sonnets and a few other pieces in Portuguese. His *Discursos morales y políticos*, published under the title of *Noches claras*, consist of dialogues, divided into seven nights. His principal historical works are: *Epítome de las historias portuguesas* (Madrid, 1628; enlarged ed., Brussels, 1730); *Asia Portuguesa* (8 vols., Lisbon, 1666-'75); *Europa Portuguesa* (3 vols., Lisbon, 1667-'78); and *Africa Portuguesa* (1681). He was among the first trustworthy writers on China, and his *Imperio de China*, edited by Father Semmedo (Madrid, 1842), has been translated into French and Italian. Lope de Vega called him the prince of critics.

FARIBAULT, a S. county of Minnesota, bordering on Iowa, and drained by Blue Earth river and its branches; area, 720 sq. m.; pop. in 1870, 9,940. The surface is mostly prairie; the soil is fertile. The Minnesota and Northwestern and the Southern Minnesota railroads pass through the county. The chief productions in 1870 were 552,940 bushels of wheat, 187,496 of Indian corn, 894,992 of oats, 25,786 of barley, 29,321 of potatoes, 15,898 tons of hay, and 259,645 lbs. of butter. There were 2,995 horses, 3,235 milch cows, 4,864 other cattle, 4,127 sheep, and 3,394 swine. Capital, Blue Earth City.

FARIBAULT, a town and the capital of Rice co., Minnesota, at the confluence of the Cannon and Straight rivers, and on the Iowa and Minnesota division of the Chicago, Milwaukee, and St. Paul railroad, 46 m. S. of St. Paul; pop. in 1870, 3,045. It is the seat of the state asylum for the deaf, dumb, and blind, and of an Episcopal academy, and contains several other schools, six or eight churches, two weekly newspapers, two national banks, and several flour mills, saw mills, founderies, &c.

FARINELLI (originally Broschi), Carlo, an Italian singer, born in Naples or in Andria, Jan. 24, 1705, died in Bologna, July 15, 1782. The extraordinary beauty of his soprano voice was attributed to his having been emasculated. He was a favorite pupil of Porpora, and met with brilliant success at the principal theatres of Italy. In 1784 he went to London, where he soon created an excitement. He performed three years in England, and netted every year £5,000. In France his success was equally

great. In Madrid he dissipated the melancholy of Philip V., became the king's chief favorite, and after his death was similarly honored by Ferdinand VI., receiving an annual salary of \$10,000, on condition that he should sing only for the royal ears. He prevailed upon Ferdinand to organize a theatre in the palace, for which he engaged eminent artists from Italy, and of which he became the director. For 20 years he ruled the court of Spain, not only by the charms of his voice, but gradually by his influence in political affairs. In 1759, on the accession of Charles III., Farinelli fell into disgrace, and three years later was ordered to leave the kingdom. He then went to Bologna, and built a splendid palace in its vicinity, in which he passed the rest of his life.

FARJEON, Benjamin L. See supplement.

FARNER, Hugh, an English theologian, born in Shropshire in 1714, died in London, Feb. 5, 1787. He was educated at the academy in Northampton under Dr. Doddridge, and became pastor of a dissenting congregation at Walthamstow, Essex, where he wrote several theological treatises. He removed to London in 1761, and became afterward preacher to the congregation of Salters' hall, and one of the Tuesday lecturers at the same place. He published an "Inquiry into the Nature and Design of our Lord's Temptation in the Wilderness" (1761), a "Dissertation on the Miracles" (1771), an "Essay on the Demoniacs of the New Testament" (1775), and a work entitled "The General Prevalence of the Worship of Human Spirits in the ancient Heathen Nations" (1783). He considered miracles to be absolute proofs of a divine mission.

FARNER, John, an American genealogist, born in Chelmsford, Mass., June 12, 1789, died in Concord, N. H., Aug. 13, 1838. After teaching school for ten years, he studied the early settlement of New England, and his "Genealogical Register," published in 1829, is thought to contain the names of nearly all the first European settlers in that region. A new and enlarged edition of this work, by James Savage of Boston, was published in 1860-'62. Mr. Farner superintended an edition of Belknap's "History of New Hampshire," to which he added many valuable notes; and he contributed various papers to historical and antiquarian societies, and to periodicals.

FARMERS GENERAL, in France, financial and privileged associations which before the revolution of 1789 took upon lease various branches of the public revenue. This system originated in the 13th century, when Philip the Fair, in consideration of certain sums paid to him, several times permitted Lombard bankers and Jews to collect the taxes. The consequent exactions, cruelties, imprisonments, and even executions, often caused popular rebellions; yet in the reign of Louis XIII. the lessees had become a power in the state, and often transferred their leases to still more unscrupulous subordinates. In 1720, under the regency, the

individual leases were united in a *ferme générale*, which was let to a company, whose members were called *fermiers généraux*. Their number was originally 40, afterward increased to 60. In consideration of an annual payment of 55,000,000 livres, they had the privilege of levying the taxes on articles of consumption; and on the renewal of this privilege in 1726, 80,000,000 livres annually were paid. In 1774 the farmers paid 135,000,000 francs for this right, and in 1789, 180,000,000, and yet made immense fortunes. In 1759 the contracts of the farmers general were quashed by Silhouette, but the system soon revived, as it was favorable to the court and ministers. The constituent assembly in 1790 suppressed the association. In 1794 all the farmers general then living were brought before the revolutionary tribunal, and condemned; 28, including Lavoisier the chemist, were executed May 8, 1794, and the remaining three some days afterward.

FARNE, Fearn, or Fern Islands, several small islands and rocks in the North sea, from 2 to 5 m. from the English coast, and nearly opposite Bamborough. Two lighthouses have been erected on the largest. In rough weather the passage between the isles is very dangerous, and several disastrous shipwrecks, attended with great loss of life, have occurred here.

FARNESE, a family of Italian princes, who derived their name from their ancestral castle of Farneto near Orvieto, and whose genealogy is traced to the middle of the 13th century. Prominent as a soldier among the early members of the family was PIETRO, who commanded the Florentine army in their victorious battle against the Pisans at San Piero, in May, 1363, and died of the plague within a few weeks. The historical celebrity of the house dates from 1534, when Cardinal Alessandro Farnese became pope under the name of Paul III. In 1545 he erected Parma and Piacenza into a duchy for the benefit of his natural son, PIETRO LUIGI, a dissolute and cruel ruler, against whom many nobles revolted in concert with Gonzaga, the imperial governor of Milan, at whose instigation he was assassinated Sept. 10, 1547.—His son OTTAVIO (1520-'86) was reconciled with Austria through his wife, the famous Margaret of Parma, natural daughter of Charles V., and his reign of over 30 years was peaceful and happy.—He was succeeded by his son ALESSANDRO (1546-'92). He was educated by his mother, and enlisted in the service of Spain in early youth. He fought in the naval battle of Lepanto in 1571, and was sent in 1577 to the Netherlands, where in the following year he took part in the victory of Gembloux, won by Don John of Austria over the Dutch. He succeeded Don John as governor of the Low Countries, and forced the Belgian provinces into submission, successively taking Maestricht, Breda, Tournay, Dunkirk, Bruges, Ypres, Ghent, and Antwerp (1579-'85), the latter city after one of the most memorable sieges recorded in history. On his father's death in

1586 he inherited the duchy, but did not even visit his dominions. In 1588 he was put in command of the armada which Philip II. of Spain sent against England; but being shut up with his army in Antwerp by the Dutch flotilla, he was only a spectator of its disastrous failure. In 1590 he invaded France at the head of the Spanish army and relieved Paris, which was then besieged by Henry IV. In 1592 he marched into Normandy, and obliged Biron to raise the siege of Rouen, one of the principal cities held by the leaguers; but he received here a wound which afterward proved fatal. Being attacked by Henry IV., who hemmed in his army between the Seine and the English channel, he foiled the efforts of his opponent, and succeeded in landing his troops on the opposite bank of the river, when they returned to the Netherlands. As for himself, he was unable to proceed further than Arras, where he breathed his last. He was a man of consummate military and diplomatic genius. A bronze equestrian statue of him by John of Bologna adorns the principal public square at Piacenza.—His successor was his son by the princess Mary of Portugal, RANUZIO I. (1569–1622). He was a lover of science and art, but notorious for his ferocity against noble families, a number of whom he had executed, confiscating their property for alleged conspiracy. He married a niece of Pope Clement VIII.—His son and successor ODOARDO (1612–'46) was fond of magnificence and lavish in the expenditure of money, and possessed various accomplishments. But, insatiable in his ambition, he entered into an alliance with France against Spain and Austria in 1633, by which he nearly lost his duchies. In 1639 Pope Urban VIII. deprived him of the duchy of Castro, upon which Odoardo had raised money which he was unable to pay. After five years of wrangling Castro was restored to him through the intervention of France and Venice.—RANUZIO II., his son and successor, was the fattest of a family noted for obesity. He died in 1694, and was succeeded by his son FRANCESCO, who died in 1727, and was followed on the throne by his brother ANTONIO. This prince, born in 1670, was likewise exceedingly corpulent, and cared for little besides eating and sleeping. Leaving no issue, he designated as his successor Don Carlos, son of Philip V. of Spain and of his niece Elizabeth Farnese. The Farnese family became extinct with him in 1731, and the rule of Parma and Piacenza passed into the hands of the infante of Spain, consequent upon a convention signed in Vienna in the same year.—The Farnese palace in Rome, now belonging by inheritance to the deposed king of Naples, was finished under the direction of Michel Angelo, who designed the whole upper part of the building with its imposing entablature. It is regarded as the finest piece of architecture in Rome, and was constructed of blocks of travertine which were taken by the nephews of Pope Paul III. from

the theatre of Marcellus and the Colosseum. The grounds are adorned by two fountains, whose granite basins, 17 ft. long and 4 ft. wide, were taken from the baths of Caracalla. The most celebrated statuary has been removed to the museum of Naples, including the torso Farnese, or Farnese bull, and the Farnese Hercules, or the Hercules of Glycon. Among the few monuments which remain in the palace is a colossal one representing Alessandro Farnese crowned by Victory, sculptured out of a column taken from the basilica of Constantine. The most exquisite paintings are the frescoes of Annibale Carracci and his pupils in the gallery on the upper floor.—The villa Farnesina, in the Lungara of the Trastevere, opposite the Corsini palace, was designed by Baldassare Peruzzi for Agostino Chigi (1506), who gave here in 1518 an extravagant entertainment in honor of Leo X.; the plate, on being removed from the table, was thrown into the Tiber. This palace, mainly celebrated for its frescoes by Raphael and his pupils, became the property of the Farnese family, and passed with its other possessions to the Neapolitan Bourbons. The kings of Naples supported here an academy of painting, and eventually sold the palace to the Spanish duke Ripalda, who still owns it.—The Farnese gardens (*Orti Farnesiani*) occupy the whole northwestern summit of the Palatine hill, and contain interesting ruins of the palaces of the Cæsars. Napoleon III. purchased these grounds in 1861 from the king of Naples for 250,000 francs, and spent 750,000 francs on the excavations alone, designed to aid in his work on Julius Cæsar. In 1870 he sold them for 650,000 francs to the city authorities of Rome, on condition of their continuing the excavations under the direction of Pietro Rosa.

FARNHAM, Eliza W., an American philanthropist and author, born at Rensselaerville, Albany co., N. Y., Nov. 17, 1815, died in New York, Dec. 15, 1864. Her maiden name was Burhans. In 1835 she went to Illinois, and in 1836 married Thomas J. Farnham. In 1841 she returned to New York, where she visited prisons and lectured to women till the spring of 1844, when she became matron of the female department of the state prison at Sing Sing, hoping to govern such an institution by kindness alone. She remained four years, and while there published "Life in Prairie Land," and edited an edition of Sampson's "Criminal Jurisprudence." In 1848 she removed to Boston, and was connected for some time with the institution for the blind in that city. In 1849 she went to California, and in 1856 returned to New York, and published "California Indoors and Out." For the next two years she studied medicine. In 1859 she organized a society to aid and protect destitute women in emigrating to the west, and went at different times to the western states with large numbers of such persons. The same year she published "My Early Days." She

again visited California, and in 1864 published "Woman and her Era" (2 vols. 12mo, New York), a work on the position and rights of woman. In 1865 appeared a posthumous work, "The Ideal Attained."

FARNHAM, Thomas Jefferson, an American traveller, husband of the preceding, born in Vermont in 1804, died in California in September, 1848. In 1839 he organized and headed a small expedition across the continent to Oregon. He went to California the same year, and took an active part in procuring the release of a large number of Americans and English who had been imprisoned by the Mexican government. In 1842 he published "Travels in Oregon Territory;" in 1845, "Travels in California and Scenes in the Pacific," and "A Memoir of the Northwest Boundary Line;" and in 1848, "Mexico, its Geography, People, and Institutions."

FARO, or **Pharo**, a game of chance at cards, said to derive its name from the figure of an Egyptian Pharaoh which was formerly placed on one of the cards. It may be played by any number of persons, who sit at a table generally covered with green cloth. The keeper of the table is called the banker. The player, called the punter (from Ital. *puntare*, to point), receives a *lioret* or small book from which to choose his cards, upon which he may at his option set any number of stakes, which are limited in amount in accordance with the capital of the banker. The banker turns up the cards from a complete pack, one by one, laying them first to his right for the bank and then to his left for the player, till all the cards are dealt out. The first card is considered blank. The banker wins when the card equal in points to that on which the stake is set turns up on his right hand, but loses when it is dealt to the left. The drawing of each two cards is called a "turn." The player loses half the stake when his card comes out twice in the same turn. This is called a "split." The last card but one, the chance of which the banker claims, but which is now frequently given up, is called *hocly* (a certainty). The last card neither wins nor loses. Where a punter gains, he may either take his money or *paroli*; that is to say, double his chance by venturing both his stake and gains, which he intimates by bending a corner of his card upward. If he wins again, he may play *sept et le va*, which means that after having gained a *paroli* he tries to win seven fold, bending his card a second time. Should he again be successful, he can *paroli* for *quinze et le va*, for *trente et le va*, and finally for *soixante et le va*, which is the highest chance in the game. Faro was formerly in vogue in France, England, and Europe generally, and still retains its popularity in various parts of the world. The method of play in the United States is as follows: The dealer, with a large array of checks at his right hand, representing \$1, \$5, \$20, and upward, takes his seat at a table. In

the centre of the table is a suit of cards, called "the lay-out," arranged in the following order:

King.	Queen.	Knave.	10-spot.	9-spot.	8-spot.	7-spot.
Ace.	Deuce.	Trey.	4-spot.	5-spot.	6-spot.	

The king, queen, and knave are called "the big figure;" the ace, deuce, and trey, "the little figure;" and the 6, 7, and 8, "the pot." On these cards the player places the sums he wishes to bet. The dealer shuffles a pack of cards (the option of shuffling resting also with any of the players who call for it), has them out, and then places them in a box, from which he deliberately slides them one by one. The first is called the "soda card," and is set aside; the next is the banker's card, and wins for him all sums bet upon it; the next is the player's card, and so on alternately. It is in the power of the player, by placing a small copper on the amount he places on the card, to reverse the chance. This, which is called "coppering," enables the player to bet on or against whichever card he pleases. The dealer stops between each two cards while new bets are being made as checks change from one card to another, and thus the game proceeds to the close of the pack, when a fresh deal is made, and the process is repeated. The bank wins on "splits," which is supposed to be the only odds in its favor; but it possesses others in its superior amount of capital, and in the inclination of most players to stake heavier in the effort to recover than to support good luck. When but two cards are left in the box, the player has the privilege of "calling the last turn," that is, guessing in which order they will appear; if correct, he wins four times the amount of his stake. In Germany the cards are not dealt from a box, but nailed to a pine board and torn off one by one by the dealer. Here the dealer is generally assisted also by one or two croupiers, who attend to the playing and receiving, guarding against errors, and shuffling the pack.

FARO, a city of Portugal, capital of the province of Algarve, near the mouth of the Valfermoso, 62 m. E. of Cape St. Vincent, and 140 m. S. E. of Lisbon; pop. about 8,500. It was destroyed by the English in 1596, and by earthquakes in 1722 and 1755, and now presents a modern appearance, though, with the exception of the principal square and of a fortress, the houses are generally poor. The town has a cathedral, a theological seminary, and a mathematical school for the army. The cathedral, said to have been a mosque, is a time-worn building. In the E. and highest part of the city is an ancient and imposing castle surrounded by Moorish walls, and in the same direction is an arch with a statue of St. Thomas Aquinas. Blindness prevails to

a great extent, owing to the light sandy soil. Sand bars render the port, which is defended by a small citadel, almost inaccessible; but tolerable anchorage is obtained in the roadstead formed by three small islands at the mouth of the river. The coasting trade is active, especially in southern fruit. Figs and oranges are the most important products.

FAROCHON, Jean Baptiste Eugene, a French medallist and sculptor, born in Paris in 1807. He studied under David, early executed busts, small statues, and medallions, received a prize in 1835, studied in Italy as a pensioner of the academy, and on his return to Paris gained reputation by his medallions. Devoting himself to statuary, he produced in 1859 his masterpiece, "The Mother," which was again exhibited in 1867. Since 1863 he has been professor at the school of fine arts.

FAROE, or Færø Isles (Dan. *Færøerne*), a group belonging to Denmark, in the Atlantic ocean, N. of Scotland, between lat. $61^{\circ} 20'$ and $62^{\circ} 25'$ N., and lon. $6^{\circ} 10'$ and $7^{\circ} 35'$ W.; area, 510 sq. m.; pop. in 1870, 9,992. They are 22 in number, 17 of the larger ones being inhabited. The largest of them are Strömö, the central island, 27 m. long and 7 m. broad, with about 2,600 inhabitants, and Osterö, 20 m. long and 10 m. broad, with a population of about 2,100. Next in size are Syderö, Sandö, and Vaagö. The interior of the islands is generally hilly, the mountains varying in height from 1,000 to 2,800 ft. The valleys are narrow, and the rivulets flowing through them are so swollen during the rainy season as to render travelling impossible. The prevailing rocks are greenstone and claystone of various kinds. Some of the islands contain coal mines, and fine opal and traces of iron, copper, and other metals are found. The soil seldom exceeds a foot in depth, though in some places it is 4 ft. deep. Turnips, potatoes, and a few other vegetables flourish, but barley is the only cereal that matures, and even that often fails in consequence of the sudden changes of temperature. There is no timber; coal and turf are used for fuel. The pasture lands are luxuriant, and the wealth of the islanders consists chiefly in sheep, which yield a very fine wool. The horses are small, but hardy, active, and sure-footed. The cows are also small. Sea fowl valuable for their flesh and feathers abound on the coasts. Ship building is carried on with success. There are cloth and stocking manufactories and a few tanneries. Fisheries of the whale, seal, cod, and herring, and the collecting of eider down, constitute a large part of the resources of the country. Bread and salt are luxuries. The population, descendants of the old Northmen, are vigorous and laborious, and of loyal and religious character. The common language is a dialect of the Norse, but the official language is Danish. The longest day of summer, including the long twilight, is 24 hours, and the shortest of winter 4 hours.—Monks from the Scottish isles first founded in the Faroe group a few hermitages.

In the 9th century fugitive Norwegian pirates established themselves under Grimr Kamban. The islands became Danish when Norway was united with Denmark in 1880. During the 18th century they were notorious as the seat of smugglers. They were occupied by the English from 1807 to 1814. The administration is composed of a Danish *amtmand* or bailiff, who is commander of the armed force, and a *landfoged*, who is director of the police; and they are represented in the legislature of Denmark by a deputy appointed by the king. Commerce with the Faroe islands is a monopoly of government, and Danish ships are permitted to approach them only between May and September. Capital, Thorshavn, on the S. E. side of Strömö; pop. about 800.

FARQUHAR, George, a British comic dramatist, born in Londonderry, Ireland, in 1678, died in London in April, 1707. After a brief career at Trinity college, Dublin, he appeared in his 17th year as a comedian upon the Dublin stage. While performing in the "Indian Emperor" of Dryden, he accidentally inflicted a serious wound upon his antagonist in fencing, which caused him to renounce the boards for ever. He went to London in 1696, obtained a commission in the army, and applied himself to dramatic composition. He lived gayly and licentiously, and during the ten years before he sank a victim to anxiety and ill health he produced seven comedies, superior in vivacity and ease of style, and in clear and rapid development of intrigue, to any that had before appeared in England. The last and best of these was the "Beaux Stratagem" (1707), which still keeps the stage. He also left a volume of "Miscellanies," consisting of poems, essays, and letters. His works have much of the smartness and indelicacy fashionable in his time, but are written in better language and are less designedly vicious than the plays which preceded the revolution of 1688. He passed a troubled though merry life, and left two daughters in indigence, whom in a brief and touching note he recommended to the kindness of his friend the actor Wilks. A complete edition of his works appeared in 2 vols. 12mo in 1772.

FARRAGUT, David Glasgow, an American admiral, born at Campbell's station, near Knoxville, Tenn., July 5, 1801, died in Portsmouth, N. H., Aug. 14, 1870. He entered the navy as midshipman at the age of 11, and his first service was on board the famous Essex, in which he participated in the engagement that resulted in the capture of the British ship *Alert*, and also in the three hours' fight in the bay of Valparaiso, March 28, 1814, before the Essex surrendered to the *Phoebe* and *Cherub*. In his report of the battle Commodore Porter commended "the lad Farragut," and regretted that he was too young for promotion. Under the same commander Farragut took part in the attack on the rendezvous of pirates at Cape Cruz on the southern coast of Cuba in 1823.

The fight lasted 12 hours, and resulted in the defeat of the pirates and the destruction of their boats and village. From this time for nearly 40 years he was sailing about the world or quietly serving at naval stations, rising slowly by seniority. He was commissioned lieutenant in 1825, commander in 1841, and captain in 1855; and his most important command in all that time was that of the *Mare Island* navy yard, California, 1854-'8. When the civil war began, Farragut was 60 years of age, and had been in the service more than 48 years. He was living at Norfolk, Va., "waiting orders," on the day when intelligence was received that Virginia had seceded. He hastily collected a few valuables, put his loaded pistols in his pocket, and within two hours was with his family on board a steamer bound north. Leaving his family at Hastings-on-the-Hudson, he reported at Washington, where he remained nine months in comparative inactivity. His first orders for active duty appointed him commander of the expedition for the capture of New Orleans and opening of the Mississippi river. These orders reached him Jan. 20, 1862, and in two weeks he was under way in his flag ship the *Hartford*. On reaching the gulf of Mexico he first arranged the blockade of the whole coast, and then with the more formidable portion of his fleet entered the Mississippi. A mortar flotilla was attached to the expedition, but Farragut placed no reliance upon it. The bombardment of the forts a little above the mouths of the river was kept up continuously for six days and nights; but the enemy daily added to their defences, and beyond the burning of the barracks within Fort Jackson the works, mounting 120 guns, were as formidable as at the commencement of the bombardment. Without further delay, Farragut in the night of April 24 signalled his squadron to get under way, and, delivering broadsides of grape, ran past the forts "under such a fire from them," he wrote, "as I imagine the world has never seen." Beyond the forts he encountered and destroyed a fleet of 20 armed steamers, 4 iron-clad rams (one of 4,000 tons), and a multitude of fire rafts. Next he silenced the two formidable Chalmette batteries, on either side of the river three miles below New Orleans, and at noon the second day anchored with the city beneath his guns. In the passage of the forts his fleet received 165 shots, 37 men were killed and 147 wounded, and one vessel, the *Varuna*, was sunk. Farragut next proceeded to Vicksburg (attacking Grand Gulf in passing), for the purpose of reducing that stronghold, and, running his vessels safely past the powerful batteries, communicated with the squadron brought down from the upper Mississippi; but notwithstanding all his exertions, the attack failed from the lack of a cooperating land force. He then repossessed the batteries and withdrew his fleet to Pensacola for repairs. On July 11, on the recommendation of the president, he received the thanks of congress, and on the reorganiza-

tion of the navy in the same month was placed first on the list of rear admirals. In the following autumn the capture of Corpus Christi, Sabine pass, and Galveston was effected by his squadron. In March, 1863, Farragut again advanced against Vicksburg, but encountered so tremendous a fire at Port Hudson that but two vessels, the *Hartford* and the *Albatross*, succeeded in passing the batteries. All the vessels of his squadron were terribly cut up, and the fine frigate *Mississippi* was destroyed. With his flag ship and her small consort he kept on to Vicksburg, and established communication with the upper Mississippi fleet and with the army under Gen. Grant. By this exploit he obtained control of the river between Port Hudson and Vicksburg, established a blockade of the Red river, and thus intercepted the supplies from Texas destined for the confederate armies. About the last of May he returned and engaged the batteries at Port Hudson, and from that time till July 9, when the garrison surrendered, efficiently cooperated with the army in its investment of the place. The following summer Farragut summoned his squadron to the attack of Mobile, and on the morning of Aug. 5, 1864, conducted his force past Forts Morgan and Gaines guarding the entrance, and further on in the bay engaged and vanquished the confederate fleet of iron-clads, winning, after a desperate fight of several hours, a victory next in lustre and consequence only to that of New Orleans. In this battle, just as the iron-clad *Tecumseh* was opposite Fort Morgan, a torpedo was exploded under her, and in three minutes she had sunk, carrying down her commander, T. A. Craven, and more than 100 of her crew. The *Brooklyn*, the leading ship of the line, supposing it to have been the confederate ram *Tennessee* which had blown up, gave three hearty cheers, but, soon discovering the mistake, made signal to the admiral: "Our best monitor is sunk." Shortly afterward the *Brooklyn* discovered a nest of torpedoes close ahead, and stopped, to avoid running into them. Farragut, who had had himself lashed to the *Hartford's* rigging, seized upon this circumstance to dash forward and assume the head of the line; a position which he had reluctantly yielded to the *Brooklyn* at the earnest solicitation of his captains, who felt confident that the leading ship would be destroyed. Again congress expressed to Farragut the gratitude of the country, and created for him the grade of vice admiral, in which office he was confirmed Dec. 21, 1864; and on July 25, 1866, congress again created a higher office, that of admiral, and conferred it upon him. In 1867 Farragut sailed from Brooklyn in the frigate *Franklin*, and commanded the European squadron until 1868. Wherever he touched during that cruise he received most distinguished honors alike from sovereigns and people. While on a journey undertaken for the improvement of his failing health, he died at the Portsmouth navy yard.

A mural tablet in his honor was placed in the church of the Incarnation, New York, Nov. 10, 1878.—See his "Life and Naval Career," by P. C. Headley (New York, 1865), and his "Life," by his son Loyall Farragut (1879).

FARRAR, Frederick W. See supplement.

FARRAR, I. John, an American mathematician, born in Lincoln, Mass., July 1, 1779, died in Cambridge, May 8, 1858. He graduated at Harvard college in 1803, and studied divinity at Andover, but accepted the appointment of Greek tutor at Harvard in 1805. In 1807 he was chosen Hollis professor of mathematics and natural philosophy. In 1818 he published for the use of his pupils a translation of Lacroix's "Elements of Algebra," followed by selections from Legendre, Biot, Bézout, and others. These works were at once adopted as text books by Harvard college, and by the United States military academy. He also contributed to the scientific periodicals, to the "North American Review," and to the "Memoirs" of the American academy. In 1836 he resigned his chair in consequence of a painful illness which eventually caused his death.

IL Eliza Retch, an American authoress, second wife of the preceding, born at New Bedford, Mass., in 1792, died at Springfield, April 22, 1870. She married Prof. Farrar in 1828. Among her earliest publications are "The Children's Robinson Crusoe," "Life of Lafayette," "Howard," and "Youth's Letter Writer." Her most popular work, "Young Lady's Friend" (1837), passed through many editions in the United States and in England. In 1865 she published "Recollections of Seventy Years."

FARREN, Eliza, countess of Derby, an English actress, born in Liverpool in 1759, died April 23, 1829. Her father, a native of Cork, who was successively a surgeon, an apothecary, and an actor, left his family in great indigence. Eliza made her début in Liverpool in 1778, and in London in 1777, where she played successively at the Haymarket, Covent Garden, and Drury Lane. Although a very graceful and lively actress, she owed her reputation chiefly to her remarkable beauty, which received the homage of the most illustrious men of the time. She was esteemed as much for her virtues as her beauty, and on May 1, 1797, became the wife of the 12th earl of Derby, then a widower.

FARS, or **Farsistan** (Pers., land of the Persians; anc. *Persia*), a S. W. province of Persia, bounded N. W. by Khuzistan, N. by Irak-Ajemi and Khorasan, E. by Kerman, S. by Laristan and the Persian gulf, and W. by the Persian gulf; area estimated at about 50,000 sq. m.; pop. between 1,000,000 and 1,500,000, including Turkomans, Baniyas, and a small number of Jews. It is divided into the Germasir and Sirhud, or warm and cold regions. The former extends inland from the coast, its surface being a sandy plain, wholly dependent for vegetation on the periodical rains. The latter comprises the more elevated region belonging to the great range of mountains which

extend from the Caucasus to the gulf, and which in this part are exceedingly steep toward the sea. This portion of the province consists of fertile valleys. A few of them, as Shiraz, Kazerun, and Merdust, are cultivated, but many are wooded and uninhabited. The southern part of the coast E. of Ras Berdistan is occupied by Arabs, who acknowledge the authority of the sultan of Muscat, and in the northern districts there are some tribes of Kurds. Eastward the country is more open, sandy, and ill supplied with water. The chief rivers are the Sitaregyan, flowing into the Persian gulf, and the Bendemir, falling into the salt lake Bakhtegan. Another salt lake, near Shiraz, supplies the province with salt. The general products of the country are tobacco in large quantity, wine, rice, dates, opium, linen, cotton, silk, cochineal, and roses for the manufacture of attar. Iron and lead mines exist, as also quarries of marble and alabaster. Borax and naphtha are among the chemical products. Attention is given to the raising of horses, camels, and asses, for use and export. The inhabitants of this province are considered the most industrious in Persia. They manufacture woollen, silk, and cotton stuffs, and carry on an extensive trade with India. The government is vested in a prince of the sovereign's family, under whom are governors of districts. There are many interesting remains of antiquity. The tomb of Cyrus is at Murgab, the ancient Pasargada; the ruins of Persepolis are between that town and Shiraz. Inoculation is said to have been known among the tribes of Fars for centuries. Among the principal towns are Shiraz, the capital; Kazerun, with excellent opium produced in the vicinity; Darab or Darabgerd, famous for its date trees; and Bushire, the chief port in the Persian gulf. (See *PERSIA*.)

FARTHINGALE (Fr. *certugadin*, It. *guardinfante*, Sp. *certugado*, guardian of virtue), a petticoat spread to a wide circumference by hoops of willow, whalebone, or iron, introduced into England under this name in the reign of Elizabeth. In the reign of Anne it was called a tub petticoat. It appeared in France early in the reign of Louis XV. under the name of *certugadin* and *panier*, or basket petticoat, its greatest diameter being made equal to the height of the lady. Its abandonment was effected near the close of the same reign by Mlle. Clairon, who appeared on the stage without it; but it again became fashionable under Marie Antoinette. In England the hoop, the successor of the farthingale, went out of fashion in the reign of George IV., who forbade it at court.

FAST (Sax. *faestan*, to keep), abstinence from food, especially as a religious observance; applied also to the period of such abstinence. Fasting was practised in all the old religions known to history, with the single exception of that of Zoroaster. It appears to have been also in use among the semi-civilized and savage tribes in both hemispheres. The Mohammedans observe strictly the fast of the month of

Ramadan, abstaining from all food daily from sunrise until sunset. On the Hebrews the law of Moses enjoined one annual fast on the day of atonement; others were observed by the nation in course of time in memory of great calamities. The modern Hebrews observe six fasts of obligation; the most fervent keep many more. The fast consists in abstaining from all food and drink from sunrise till nightfall, the fast of atonement alone from sunset until nightfall the next day. Both the eastern and western churches from the earliest times observed the Lenten fast of 40 days in memory of Christ's fasting. The Greek church enjoins fasts on all Wednesdays and Fridays, on the 40 days before Christmas, and the 40 days before Easter, the period extending from the week after Pentecost until June 29, and from Aug. 1 to Aug. 14, besides numerous other fasts as a preparation to ecclesiastical festivals; in all 180 fast days in the year. There is a legal distinction made by both the Latin and eastern churches between "fasting," which implies the refraining from all food, and "abstinence," which is the refraining from flesh meat, eggs, milk, butter, and cheese. Thus, Roman Catholics abstain from flesh meat on all Fridays except Christmas day, and on the rogation days, or three days before Ascension Thursday. The fasts universally observed in the Catholic church are those of Lent, of the ember days, and of the vigils of Christmas, Pentecost, the Assumption (Aug. 15), and All Saints (Nov. 1). —Protestants generally admit the utility of fasting, while denying its necessity. They do not admit the legal distinction between fasting and abstinence. The English church and the Protestant Episcopal church of America maintain on their ecclesiastical calendar, under the name of fasts, both the "days of abstinence" and the "fast days" of the Catholic church. The Presbyterian church in the United States follows the doctrine of the Westminster Confession, that "solemn fastings" are "in their times and seasons" to be used in a holy and religious manner. The Methodist Episcopal church enjoins fasting or abstinence on the people, and advises weekly fasts to be kept by her clergy. The New England Puritans, while rejecting ecclesiastical fasts, observed themselves "seasons of fasting and prayer," and admitted both the right and duty of the civil ruler to set apart days for such purpose. In New England it is still customary for the governors of states to appoint in the spring "a day of fasting, humiliation, and prayer," which is generally observed in the churches. During the civil war the president of the United States recommended by proclamation such days to be observed by the nation.

FASTI, in Roman antiquity, registers of the days, months, and other divisions of the year, corresponding to modern calendars. The term is variously derived from *fas*, divine law, and *fari*, to speak, as it properly designated those days of the year on which legal business could

without impiety be transacted, or legal judgment be given by the magistrates. The *fasti calendares* or *sacri*, the chief division of these registers, contained the enumeration of all the days, divided into months and weeks of eight days according to the *nundinæ* (the days of each of the latter being designated by the first eight letters of the alphabet), the *calendæ*, *nonæ*, and *ides*. Days on which legal business could be transacted were marked by F. as *fasti*; those from which judicial transactions were excluded by N. as *nefasti*; the days on which justice could only be administered at certain hours were called *ex parte fasti*, also *intercisi*, and were marked in the calendar, when justice could be demanded during the early part of the day, by F. P., *fasto primo*; and days on which the assemblies of the comitia were held by C. Primarily these registers are said to have been intrusted by Numa as sacred books to the care of the pontifex maximus, and for nearly four centuries the knowledge of the calendar continued to be in exclusive possession of the priests, one of whom regularly announced the new moon, and the period intervening between the *calendæ* and the *nonæ*. On the *nonæ* the *rex sacrorum* proclaimed the various festivals to be observed in the course of the month, and the days on which they would fall. This knowledge, previously jealously kept to themselves by the priests and patricians, was first made public in 304 B. C. by Cneius Flavius, by some believed to have been a scribe to Claudius Cæcus. Besides the above mentioned divisions of time, with their notation, they generally contained the enumeration of festivals and games, which were fixed on certain days, astronomical observations on the rising and setting of the stars and on the seasons, and sometimes brief notices about religious rites, as well as of remarkable events. In later times flattery inserted the exploits and honors of the rulers of Rome and their families. The rural *fasti* (*rustici*, distinguished from the *urbani*) also contained several directions for rustic labors to be performed each month. A different kind of *fasti* were those called *annales* or *historici*, also *magistrales* or *consulares*, a sort of chronicles, containing the names of the chief magistrates for each year, and short accounts of remarkable events noted opposite to the days on which they occurred. Hence the meaning of historical records in general attached to the term *fasti* in poets, while it is used in prose writers of the registers of consuls, dictators, censors, and other magistrates, belonging to the public archives. Several specimens of *fasti* of different kinds have been discovered in the last three centuries, none of which, however, are older than the age of Augustus. The *fasti Maffei*, the complete marble original of which was long preserved in the Maffei palace at Rome, but finally disappeared, are now known by a copy prepared by Pighius; the *Verriani*, known as the Prænestine calendar, comprising only five months, are histor-

ically no less remarkable. The latter appear to have contained ample information about festivals, and details of the honors bestowed upon and the triumphs achieved by Cæsar, Octavianus, and Tiberius. A most remarkable specimen of the second class was discovered in 1546 in the Forum Romanum, in large fragments, giving the list of consuls from the 250th to the 765th year of Rome, and is known under the name of *fasti Capitolini*. New fragments were found in 1817 and in 1818. Originally they contained the records of Rome from the expulsion of the kings to the death of Augustus. Labbe has given *fasti consulares* out of a MS. of the college of Clermont in his *Bibliotheca Nova*. Several modern writers, as Sigoninus, Reland, and Baiter, have published chronological tables of Roman magistrates under the title of *Fasti*.

FASTING. See supplement.

FAT. See ADIPOSE SUBSTANCES, ALIMENT, and CORPULENCE.

FATA MORGANA, or castles of the fairy Morgana, a mirage occasionally seen from eminences on the Calabrian shore, looking westward upon the strait of Messina. It occurs in still mornings, when the waters are unruffled by breeze or current, and the sun, rising above the mountains of Calabria, strikes down upon the smooth surface at an angle of 45°. The heat then acts rapidly upon the stagnant air, the strata of which but slowly intermingling present a series of mirrors which variously reflect the objects upon the surface. The tides must have operated to raise the surface into a convex form, as sometimes occurs at this locality. Objects on the Sicilian shore opposite, beneath the dark background of the mountains of Messina, are refracted and reflected upon the water in mid channel, presenting enlarged and duplicated images. Gigantic figures of men and horses move over the picture, as similar images in miniature are seen flitting across the white sheet of the camera obscura. Sometimes the sky above the water is so impregnated with vapor that it surrounds these objects with a colored hue. The wonderful exhibition is but of short duration. The phenomenon is not peculiar to this locality, though the configuration of the coast and the meteorological conditions of the region concur to render its exhibition more frequent and more beautiful here than elsewhere.

FATES. See PARCÆ.

FATIMITES, or *Fatimides*, the descendants of Fatima, the daughter of Mohammed, a powerful Arab dynasty which for two centuries ruled Egypt and Syria, while the Abbasside caliphs reigned at Bagdad. They claimed as their founder Ismael, the 6th of the 12 imams who were descended from Ali and Fatima; but this claim was disputed, and they were variously said to have first appeared in Persia, in Egypt, and at Fez, and to have been descendants of a Jew, a locksmith, and an eastern sage. They first attained to empire under Abu Obeidallah, who in A. D. 909 announced himself in Syria as

the *mahdi*, or director of the faithful, foretold by the Koran, and expected as the Messiah by a class of heterodox Mussulmans. Denounced by the caliph, he fled to Egypt, was imprisoned for a time in north Africa, but was afterward recognized as a messenger from heaven, and made himself caliph of the whole country from the straits of Gibraltar to the border of Egypt. His successor conquered the island of Sicily. Moez, the 4th caliph, wrested Egypt from the Abbassides in 970, founded Cairo, fixing his residence in its present suburb of Fostat, and conquered Palestine and a large part of Syria. Aziz, his successor (975-996), consolidated and extended his conquests, and embellished Cairo with many monuments. His son Hakem (996-1021) was preëminently distinguished for fanaticism and cruelty, persecuting alike Christians, Jews, and orthodox Mohammedans. Declaring himself a manifestation of God, he became near the close of his reign the founder of a new religion, now represented by the Druses of Syria, who expect his reappearance as their Messiah. From his time the power of the Fatimites declined. On the death of Adhed, the 14th caliph, in 1171, the dynasty was extinguished, and a new one established by Saladin. (See CALIPH.)

FAUCHE, Hippolyte, a French orientalist, born at Auxerre in 1797, died at Juilly, department of Seine-et-Marne, in 1869. His fortune enabled him to devote his whole life to Hindoo literature, and he translated into French many celebrated Sanskrit poems and other works. His labors were repeatedly rewarded by academical prizes. His most extensive translations are the *Râmâyana* (9 vols., 1854-'8) and the *Maha Bharata* (7 vols., 1868-'7), which latter was interrupted by his death. He also published poetry and a novel.

FAUCHER, Léon, a French political economist, born in Limoges, Sept. 8, 1803, died in Marseilles, Dec. 14, 1854. When a boy he supported himself and his mother by making designs for embroidery, and afterward became a teacher in Paris. After the revolution of 1830 he was successively editor of the *Temps*, the *Constitutionnel*, and the *Courrier Français*. He was chosen to the chamber of deputies for Rheims in 1846, and, joining the opposition party, was prominent in the debates on questions touching political economy. He was elected by the department of Marne to the constituent assembly of 1848. In December of that year, and again in April, 1851, he was appointed by Louis Napoleon minister of the interior, serving each time but a few months. He was instrumental in preparing the law of May 31, 1850, restricting the limits of suffrage; but he declined to accept office under Louis Napoleon after the *coup d'état*. He now devoted himself chiefly to the interests of the *crédit foncier*, having previously become known by his advocacy of a gradual reduction of duties, and of a commercial league between France, Belgium, Spain, and Switzerland, as a coun-

terpoise to the German Zollverein. Among his remarkable earlier efforts were an essay in the *Revue des Deux Mondes* on the relations of property in France, and a pamphlet in 1838 on prison reform. His principal work, *Études sur l'Angleterre*, a description of the social, industrial, and political institutions of England, appeared in 1845.

FAULK, a S. E. central county of Dakota territory, recently formed, and not included in the census of 1870; area, about 900 sq. m. It is drained by the North fork of Dakota or James river, and consists largely of table land.

FAUNS, in Roman mythology, rural divinities, descended from Faunus, king of Latium, who introduced into that country the worship of the gods and the labors of agriculture. The poets ascribed to them horns, and the figure of a goat below their waist, but made them gayer and less hideous than the satyrs. Fauna, like satyrs, were introduced upon the ancient stage in comic scenes. The cabalistic mythology also admits the existence of fauna, whom it regards as imperfect creatures. It supposes that God had created their souls, but, surprised by the sabbath, had not time to finish their bodies. Hence these unfinished beings seek to shun the sabbath, on which day they retire to the deepest solitudes of the forests.

FAUNTILERoy, Henry, an English forger, born in London about 1784, executed there, Nov. 30, 1824. He early joined the London banking house of Marsh, Stracey, and co., and about 1814 began a system of forgeries involving about £400,000, though the bank of England prosecuted him only for £170,000. Among his papers was a most business-like statement, drawn up by his own hand as a private memorandum, containing a list of transactions to the amount of £120,000, with the names of the persons whom he had defrauded by selling the stocks they had deposited with him, through forged powers of attorney; and the conclusive plainness of this statement led to his conviction. The interval of ten years between the beginning and the detection of his crime has been ascribed to his presumed integrity, and to the fact of his forgeries having been committed upon funded property and not upon bills of exchange, including an amount of £200,000 that belonged to his own wards, which he drew by means of forged documents. Besides, he had no accomplices, and all the transactions were confined to England, and chiefly to London. Fauntleroy was the last forger hanged in England, capital punishment for forgery having been finally abolished in 1832.

FAUQUIER, a N. E. county of Virginia, bounded N. W. by the Blue Ridge, and S. W. by the Rappahannock river and one of its branches; area, 680 sq. m.; pop. in 1870, 19,960, of whom 7,856 were colored. It has a diversified surface, a productive soil, and is rich in minerals. There are several gold mines which have been worked with profit, and beds of magnesia and soapstone have been discovered. It is traversed

by the Orange, Alexandria, and Manassas railroad and branches. The chief productions in 1870 were 269,952 bushels of wheat, 824,947 of Indian corn, 180,591 of oats, 37,010 of potatoes, 6,611 tons of hay, 194,986 lbs. of butter, and 39,493 of wool. There were 5,811 horses, 5,325 milch cows, 15,208 other cattle, 12,137 sheep, and 14,289 swine; 19 flour and 2 saw mills, 6 tanneries, and 6 currying establishments. Capital, Warrenton.

FAURE, Jean Baptiste, a French vocalist, born at Moulins, Jan. 15, 1830. He first appeared at the Opéra Comique in 1852, and in 1857 became professor at the conservatory, where he had been educated. In 1861 he made his first appearance at the Grand Opéra, and he has since acquired great reputation as a baritone singer, his voice being both powerful and sweet. He is most admired in Mozart's *Don Juan*, Meyerbeer's *Africaine*, Thomas's *Hamlet*, and as Mephistopheles in Gounod's *Faust*, in which he excels as a basso.—He married in 1860 **CONSTANCE CAROLINE LEFEBVRE**, born in Paris, Dec. 21, 1828. Having at an early age become acquainted with Auber, she was induced by him to cultivate her voice at the conservatory, where she gained a prize in 1842. She first performed at the Opéra Comique in 1852, gradually rising to distinction by her pleasant and well trained voice and sprightly acting. Her best parts were in the *Val d'Andorre*, the *Étoiles du Nord*, and kindred operas. In 1863 she performed in Mendelssohn's *Lisbeth* at the Théâtre Lyrique, but has since retired from the stage.

FAURIEL, Claude Charles, a French historian and critic, born in St. Étienne, Oct. 21, 1772, died in Paris, July 15, 1844. After receiving a good education he entered the army in 1793, served under La Tour d'Auvergne, and became secretary to Gen. Dugommier; but after a year's service he returned to St. Étienne, where he received a civil appointment. Subsequently he was private secretary to Fouché, minister of police, but resigned in 1802 when he saw Napoleon about to be made consul for life. He had in the mean while contracted literary tastes and friendships. He studied Arabic with De Sacy, and was one of the first Europeans to learn Sanskrit; gathered a multitude of facts as to the less known tongues, as the Basque, Gallic, and Old German; wrote translations from the Danish poet Baggesen, and the Italian poets Manzoni and Berchet; collected materials for a history of stoicism, which he never finished; and translated many Greek songs. From 1824 to 1826 he resided in Italy, studying oriental languages, and soon afterward founded, in connection with other orientlists, the Asiatic society. In 1830 he was appointed professor of foreign literature in the faculty of letters at Paris. This chair, which was created for him by the duke de Broglie, he filled for nearly 14 years, lecturing on comparative philology, the origin of the French and Italian languages, ancient and mediæval poetry,

and the drama. His principal works are: *Chants populaires de la Grèce moderne*, with translations and notes (1824-'5); *Histoire de la Gaule méridionale sous la domination des conquérants germaniques* (4 vols., 1836); *Histoire de la croisade contre les hérétiques albigeois*, translated from the Provençal verse of a contemporary (1837); *Histoire de la poésie provençale* (3 vols., 1846); and *Dante et les origines de la langue et de la littérature italiennes* (2 vols., 1854); besides some literary collections, and important articles in the *Revue des Deux Mondes* (1832-'43), and in the *Bibliothèque de l'École des Chartes*. A portion of the "History of Provençal Poetry" was translated into English by G. J. Adler (New York, 1860).

FAUST, or Faustus, Dr. Johann, a prominent character of the national and popular poetry of Germany. According to tradition, he was a celebrated necromancer, born about 1480 at Knittlingen in Würtemberg, or, as others have it, at Roda, near Weimar, or Anhalt. He is said to have studied magic at Cracow. Having mastered all the secret sciences, and being dissatisfied at the shallowness of human knowledge, he made an agreement with the Evil One, according to which the devil was to serve Faust for full 24 years, after which Faust's soul was to be delivered to eternal damnation. The contract, signed by Faust with his own blood, contained the following conditions: "1, he shall renounce God and all celestial hosts; 2, he shall be an enemy of all mankind; 3, he shall not obey priests; 4, he shall not go to church nor partake of the holy sacraments; 5, he shall hate and shun wedlock." Faust having signed these conditions, Satan sent him as a familiar spirit Mephistopheles, a devil "who likes to live among men." Faust now began a brilliant worldly career. He revelled in all manner of sensual enjoyment, of which his attentive devil servant, with an inexhaustible fertility of imagination, was always inventing new and more attractive forms. When remorse tormented Faust and surfeit led him to sober reflection, Mephistopheles diverted him with all kinds of curious devilries. Disgusted at last with his life of dissipation, Faust yearned for matrimony; but Satan appeared in all the terrors of fire and brimstone, frightened him out of this purpose, and then sent him from the lower regions the beautiful Greek Helena as a concubine, who bore him a son, Justus Faustus. As the term of 24 years draws to its close, he seeks relief and salvation from priests, but nothing avails him. All flee from the doomed man. Midnight approaches; an unearthly noise is heard from Faust's room, the howling of a storm which shakes the house to its very foundation, demoniacal laughter, cries of pain and anguish, a piercing, heart-rending call for help, followed by the stillness of death. Next morning they find Faust's room empty, but on the floor and walls evidence of a violent struggle, pools of blood and shattered brains; the corpse, mangled in a

most horrible manner, they find upon a dunghill. The beautiful Helena and her son have disappeared for ever.—That some such person as Faust has existed is asserted in the most direct manner by writers who profess to have conversed with him. Among these eye witnesses are Philip Melancthon, the great reformer, and Conrad Gesner; and even in Luther's "Table Talk" mention is made of Dr. Faustus as a man irretrievably lost. But it is not certain that the real name of this man was Faust. Joseph Görres maintains that a certain George Sabellicus is the only historical person in whom the original of Faust can be recognized. Faust's death is presumed to have taken place in 1538. Tradition has connected with his name a great number of biographical traits and magical feats formerly ascribed to other reputed conjurers. The tragical fate of Faust is represented as resulting from an irreconcilable conflict of faith and knowledge. Goethe, in his grand drama, has attempted a poetical solution of the legend. The moral of his *Faust* is, that man's longing after knowledge may lead him into extraordinary errors and failings, but cannot destroy his better nature.—The first printed biography of Faust appeared in 1587, at Frankfurt: *Historia von D. Johann Fausten, den weitbeschreyten Zauberer und Schwerekünstler*. In 1588 appeared a rhymed edition and a translation into low German; in 1589, a translation into French, *Histoire prodigieuse et lamentable de Jean Faust*; about the same time an English version, "A Ballad of the Life and Death of Doctor Faustus, the great Conjurer;" and shortly after, "The History of the Damnable Life and Deserved Death of Dr. John Faustus." The latter version seems to have been the basis of Christopher Marlowe's drama, "Life and Death of Dr. Faustus," which in its turn was transformed into a German puppet play, from which Goethe drew the first conception of his tragedy. In 1599 G. R. Widmann published *Warhaftige Historien von den grewlichen und abschewlichen Sünden und Lastern, auch von vielen wunderbarlichen und seltsamen abentheuren so D. Johannes Faustus hat getrieben* (8 vols., Hamburg). A new version appeared in 1674, which was often republished, but replaced at last by an abridged edition of Widmann's work (1728). A great number of books on necromancy also pretend to give, from original manuscripts of Faust, his cabalistic formulas, charms, talismans, &c. All of these publications, and also all important monographs bearing upon this subject, have been reprinted in the valuable collection of J. Scheible, *Das Kloster weltlich und geistlich* (Stuttgart, 1847). More than 250 different works on the legend of Faust are enumerated in Peter's *Literatur der Faustsage* (2 vols., Halle, 1849).

FAUST, or Fust, Johann, an associate of Gutenberg and Schöffer in the first development of the art of printing, born in Mentz, died in Paris about 1466. He was a wealthy gold-

smith, and probably had no share in the invention of the art. His connection with it commenced in 1450, when Gutenberg induced him to enter into partnership with him, and advance funds to establish the business of printing at Mentz, Faust having a lien on the materials as security. The only known productions of the press of Faust and Gutenberg are an indulgence granted by Pope Nicholas V. to Paulinus Chappe, ambassador of the king of Cyprus, of which 13 copies on vellum printed in 1454 remain, and two copies of a second edition printed in 1455, and an "Appeal to Christendom against the Turks," supposed to belong to the former year. The celebrated folio Latin Bible of the Mazarin library is also attributed to this period. This is a close imitation of the best writing, the rubricated capitals being written in by hand. A copy of it, the only complete one in America, is in the library of Mr. James Lenox of New York; it cost \$2,600. In 1455 Faust put an end to the partnership by suing Gutenberg for his advances, and taking possession of the greater part of the stock in satisfaction of the debt. Faust then associated with himself Peter Schöffer, his son-in-law, who had been in their employment, and had perfected the process of making movable metallic types by the invention of the punch. The first complete result of this new invention was the *Rationale Divinorum Officiorum* of Durandus (large folio, 1459). Two editions of a psalter, beautifully executed, had previously appeared with the imprint of Faust and Schöffer (1457 and 1459), but in these the large capitals were cut on wood. Copies of nine other works from their press with date and imprint still exist, including a Latin Vulgate Bible (2 vols. large fol., 1462), and the *De Officiis* and *Paradoxa* of Cicero (small fol., 1466; a copy of this, the first printed classic author, is in the Astor library, New York). At the sacking of Mentz in 1462 by one of the two rival archbishops, Adolph of Nassau, Faust's workmen were scattered, and the printing process, which had been kept as a secret in Mentz, was divulged by them in other countries. A short time afterward, however, Faust was enabled to resume his operations. He made several journeys to Paris, where he is supposed to have died of the plague.

FAUSTIN I. See SOULOUQUE.

FAUSTINA. I. *Annia Galeria*, commonly distinguished as Faustina Senior, daughter of Annius Verus, prefect of Rome, and wife of the emperor Antoninus Pius, born about A. D. 104, died in 141. She ascended the throne with Antoninus in 138, receiving the title of Augusta; and though the emperor grieved at her profligacy, his affection for her made him place her after death among the goddesses, raise temples and altars to her, and have medals struck in her honor, exceeding in number and variety those in honor of any other Roman empress. II. *Annia*, called Faustina Junior, younger daughter of the preceding, wife of her cousin the em-

peror Marcus Aurelius, born about A. D. 125, died in 175. She surpassed even the dissolute manners of her mother. The emperor was aware of her disorderly life, but loved her notwithstanding the raileries and murmurings of the people and the advice of his friends. She accompanied him in an expedition to the East, and suddenly died at a village near the foot of Mt. Taurus. Aurelius mourned for her, ranked her among the goddesses, caused medals to be struck in her honor inscribed *Pudicitia*, and exalted the place where she died into a city named Faustopolis.

FAUVEAU, *Félicie de*, a French sculptress, born in Florence in 1808. She belongs to an old legitimist family of Brittany, and was patronized by Louis XVIII. and Charles X. She partook in 1832 in the royalist movement in La Vendée, and on the arrest of the duchess de Berri escaped to Brussels, and then to Florence. Her group of "The Abbot" (1827) illustrates one of Walter Scott's romances, and her most successful work represents Christina and Monaldeschi (1829). In 1842 she exhibited in Paris various works, including "Judith showing the Head of Holophernes to the People." Prominent among her later works are the Dante monument (1852), representing the tragic death of Paolo Malatesta and Francesca da Rimini, and the mausoleum of a young Florentine girl (1860).

FAUVELET, *Jean Baptiste*, a French painter, born in Bordeaux in 1822. He is a disciple of Meissonier's style of genre painting. His earliest pictures, "A Young Man Reading" (1845), "The Two Roses," and "The Concert" (1847), were succeeded in 1848-'9 by "Nonchalance" and "The Carver." The government purchased in 1855 his "Two Musicians" for the Luxembourg. Among his later paintings is "The Prodigal Son" (1869).

FAVARA, a town of Sicily, in the province and 8 m. S. E. of the city of Girgenti, on an eminence; pop. about 13,500. It has a beautiful castle, built in the 14th century, and in the neighborhood are many sulphur pits.

FAVART, *Marie Justine Benoîte*, a French actress, born in Avignon in 1727, died in 1772. She was a daughter of M. du Ronceray, a musician, and first appeared as a vocalist at the Opéra Comique, Paris, in 1744, under the name of Mlle. de Chantilly. Next year she married the dramatist and inventor of the vaudeville, CHARLES SIMON FAVART, who, by following soon after the camp of Marshal Saxe with a dramatic troupe, subjected himself and his wife to severe persecutions on account of her rejecting the marshal's addresses. After the marshal's death in 1750 she resumed acting in Paris, chiefly in her husband's plays. She excelled equally as actress, singer, and dancer, and introduced many excellent innovations in costume and other accessories. The plays of her husband, who survived her 20 years, fill 10 volumes, and some of her own are included in *Œuvres choisies de M. et Mme. Favart* (Paris,

1800).—Their son, CHARLES NICOLAS JOSEPH JUSTIN (1749-1806), became also an actor and playwright.

FAVART, Pierrette Ignace, popularly known as Marie Favart, a French actress, born at Beaune, Feb. 16, 1833. Her family name was Pinigaud, but she assumed the name of M. Favart, who adopted her as a daughter. She was educated at the conservatory, and became a most popular actress and a member of the Théâtre Français. She belongs to the classical school, and is singularly elegant and impressive in her appearance and most exquisite in her elocution. She was greatly admired in 1844 as Esther, and among her most brilliant impersonations is Dofia Sol in *Hernani*.

FAVERHAM, or Faversham, a market town, borough, and parish of Kent, England, and a member of the cinque port of Dover, on a branch of the Swale, 45 m. E. S. E. of London; pop. in 1871, 7,189. It contains a handsome church, several chapels, schools, and assembly rooms, a theatre, and the remains of an abbey founded by King Stephen. The town has long been famous for the manufacture of gunpowder, and has also some factories of Roman cement. Its chief trade is in oysters. It is accessible to vessels of 150 tons.

FAVIGNANA (anc. *Ægæa* or *Ælæa*, an important Roman naval station), an island of the *Ægæades* group in the Mediterranean, 8 m. from the N. W. coast of Sicily; pop. 4,000. It is about 5 m. long and from 2 to 8 m. broad. The surface is low, with the exception of a range of hills running through the centre, on the culminating summit of which is the castle of Santa Catarina. There is a good harbor on the E. side, on which stand the town and fortress of San Leonardo. San Giacomo, the principal place, is on the N. coast. The island produces good wine and fruits, and has several quarries and extensive tunny and anchovy fisheries, in the produce of which, and in sheep, goats, poultry, &c., it has a flourishing export trade.

FAVOSITES, a family of fossil corals belonging to the hydroid scalepha. Their cells are

divided by horizontal partitions, like those of the millepores, which, according to Agassiz, are true scalepha; but the species are so polyp-like that until recently they were classed with the polyps. According to Dana, they are a comprehensive type, intermediate between the

polyps and the higher scalepha, and having some of the characters of both. They are all palæozoic, especially Devonian and upper Silurian.

FAVRAS, Thomas Malm, marquis de, a French conspirator, born in Blois in 1745, hanged in Paris, Feb. 19, 1790. Having entered the army and served in several campaigns, he was made

first lieutenant in the Swiss guards of the count de Provence (afterward Louis XVIII.), and in 1787 commanded a legion in Holland during the insurrection against the stadtholder. In December, 1789, he was apprehended as the ringleader of a plot to introduce an army of 80,000 men, Swiss and Germans, into Paris by night, which was to murder Bailly, Lafayette, and Necker, and to carry off the royal family and the seals of state to Péronne. He was supposed to be a secret agent of the highest personages, and suspicion was directed to the count de Provence, who exculpated himself by a speech at the hôtel de ville. Favras was summoned before the Châtelet, where he defended himself with great calmness. His witnesses were refused a hearing, and the whole trial was conducted in the most irregular manner. The populace shouted "Favras to the lamp post," and he was condemned to be hanged. He met his fate with unshaken fortitude. When told that no revelations would save his own life, he answered, "Then my secret shall die with me." His execution took place at night, by the light of torches, amid the jests of the crowd.

FAVRE, Jules Claude Gabriel, a French statesman and advocate, born in Lyons, March 21, 1809. His ancestors came from Piedmont, and his father was a merchant. He studied law in Paris, early acquired eminence by defending (1834-'5) persons implicated in socialist and revolutionary proceedings, and after the revolution of Feb. 24, 1848, was successively chief secretary in the ministry of the interior, member of the constituent assembly, and under secretary for foreign affairs. Elected to the legislative assembly, he was one of the leaders of the opposition during the presidency of Louis Napoleon, and after the *coup d'état* of Dec. 2, 1851, declined to recognize the new constitution. Defeated as a candidate for the corps législatif in Lyons in 1857, he was returned in 1858 by a district of Paris, and won additional fame by his brilliant though unavailing defence of Orsini, who had attempted to assassinate the emperor. He was the most eloquent of the five so-called irreconcilable opponents of the second empire. Being chosen in 1863 as representative both in Paris and Lyons, he took his seat for the latter city, and made powerful speeches against the Mexican expedition and against the imperial policy in regard to the Roman question, and denounced the convention of Gastein as favoring the unity of Germany at the expense of France. Though persevering in his hostility to Napoleon III., he was defeated by the socialist Raspail at the election of 1869, and only secured his reelection in Paris, where he was opposed by Rochefort and Cantagrel, by the latter's withdrawal. His vehement opposition to the policy of the emperor, continued during the Ollivier ministry and the *plébiscite* movement in the earlier part of 1870, contributed much to increase public excitement; and he also joined Thiers in con-

demning the warlike preparations against Prussia, which ended in the declaration of war on July 19. But from the moment he saw the country irretrievably committed to the contest, he accepted the situation and insisted upon immediately arming the national guard. In the session of the corps législatif held the day after the surrender of Sedan, Favre denounced Napoleon and his régime as responsible for the national disasters, and the next day (Sept. 4) urged his deposition and that of his dynasty, and proposed the appointment of an executive committee for resisting to the last the invasion of French territory. The republic being proclaimed, he became vice president of the provisional government of national defence, and minister of foreign affairs. In his diplomatic circular he declared that France would not cede an inch of her soil nor a stone of her fortresses, and held Prussia responsible for the continuation of the war, since the ruler who had begun it was supplanted by a new government which had nothing to do with the opening of hostilities. He met Bismarck at the castle of Ferrières, Sept. 19, and undertook to pay any amount of indemnity, but rejected any cession of territory as humiliating and dishonorable. The conditions imposed by Bismarck in a subsequent interview for an armistice pending the elections were not accepted. A state paper issued by Favre on the subject of these negotiations led to a counter-statement from Bismarck, Sept. 27, and the war went on. In October, after Gambetta's departure for Tours, Favre became *ad interim* minister of the interior, and attempted to put down the seditious movements in the besieged capital. On Oct. 31 he shared the captivity of Gen. Trochu in the invasion of the hôtel de ville. After the conclusion of a three weeks' truce with the Germans on Jan. 28, he insisted upon respecting it, and Gambetta's contrary decrees were declared null and void. Favre continued to be minister of foreign affairs after the election of Thiers as provisional president in February, 1871, and he went to Frankfort with the minister of finance, Poyer-Quertier, to sign with Bismarck the definitive treaty of peace (May 10). He resigned his post at the end of July, the ostensible cause being his disagreement with Thiers and the majority of the assembly in regard to the petitions in favor of the restoration of the temporal power of the pope; but the increasing influence of the conservative party had rendered his position untenable for some time, although his personal relations with Thiers never ceased to be cordial. His reputed wife had died June 12, 1870; and one Laluyé having asserted that she had been only his mistress, Favre prosecuted him and others for defamation, and though Laluyé was fined and imprisoned for one year, the mortifying publicity given to the affair confirmed him in his desire to withdraw from politics for a time, and devote himself exclusively to the law. He

has published *Rome et la république française* (Paris, 1871), and *Le gouvernement du 4 septembre* (2 vols., 1871-'2), which have been translated into English.

FAWCETT, Henry, an English political writer and statesman, born in Salisbury in 1838. He graduated at Trinity hall, Cambridge, in 1858, and was elected a fellow in the same year. In 1857 he unsuccessfully contested Southwark, on liberal principles, for parliament. In September, 1858, while out shooting, he met with an accident by which he lost the sight of both eyes; but he nevertheless became an extensive contributor to the reviews of articles on political science and economy, and has published several works, among which are "A Manual of Political Economy" (1863) and "The Economic Position of the British Laborer" (1866). He contested the borough of Cambridge unsuccessfully in 1862, and in 1868 was elected professor of political economy in the university of Cambridge. In 1864 he ran for Brighton, and was again defeated, but was returned for that place in 1868, and reelected in 1868. In parliament he has distinguished himself as an advocate of republican principles, in conjunction with Sir Charles Dilke and Auberon Herbert. In 1869 he published a revised edition of his "Manual of Political Economy," with two new chapters on "National Education" and "The Poor Laws and their Influence on Pauperism," and in 1871 a work entitled "Pauperism, its Causes and Remedies." A collection of his "Speeches" was published in 1878. — Prof. Fawcett was married, April 28, 1867, to Millicent Garrett, who published in 1870 a "Political Economy for Beginners;" and in 1872 appeared a joint work entitled "Essays and Lectures, by Henry and Millicent Garrett Fawcett."

FAWKES, Gay, an English conspirator, born in Yorkshire, executed in London, Jan. 30, 1806. He was a soldier of fortune in the Spanish army in the Netherlands, when in 1804 the scheme of blowing up the parliament house, with the king, lords, and commons, was conceived by Robert Catesby, in revenge for the penal laws against Roman Catholics. Fawkes was admitted into the conspiracy, and returned to England in May of that year. Thomas Percy, one of the confederates, rented a house adjoining that in which parliament was to assemble, of which Fawkes, who was unknown in London, took possession as his servant, under the assumed name of Johnson. Parliament was soon after adjourned till Feb. 7, 1605, and on Dec. 11 preceding the conspirators met in the hired house of Percy, and began to excavate a mine. Seven men were thus occupied until Christmas eve, never appearing in the upper part of the house, while Fawkes kept constant watch above. Parliament was again prorogued from Feb. 7 to Oct. 3, and the conspirators therefore dispersed for a time, but completed their arrangements between February and May. They hired a vault immediately below the house of lords, which had

just been vacated by a dealer in coal, into which they conveyed by night 86 barrels of powder, and covered them with fagots. They again dispersed, Fawkes proceeding to Flanders to secure foreign coöperation. As money was needed, three wealthy gentlemen, Sir Everard Digby, Ambrose Rookwood, and Francis Tresham, were made privy to the plot. The meeting of parliament was again deferred to Nov. 5, and Fawkes was appointed to fire the mine. The conspiracy was detected by an anonymous letter entreating Lord Monteagle, a Roman Catholic peer, to absent himself from the parliament, and intimating a terrible danger. The letter resulted in a search on the night of Nov. 4, when Fawkes was seized just after issuing from the cellar, in which the powder was discovered. Matches and touchwood were found in his pockets. Brought before the king and council, he boldly avowed his purpose, but not even the rack could extort the names of his associates till they had appeared in arms. The failure of the plot was complete. Fawkes was arraigned, condemned, and executed, as were seven of his confederates, while others were tried separately. This conspiracy led to additional penal statutes against the Roman Catholics. The anniversary of the plot, Nov. 5, was long celebrated in England and New England by the boys carrying about an effigy of Guy Fawkes, which was finally burned. It was till recently a legal holiday in England.

FAXARDO, Diego Saavedra y, a Spanish author and statesman, born in Algezara, in the province of Murcia, in 1584, died in Madrid, Aug. 24, 1648. Having graduated as a doctor of law at the university of Salamanca, he accompanied as secretary Cardinal Borgia, appointed ambassador to Rome, and afterward succeeded him. His talents and ability in his negotiations gained for him the favor of his sovereign, and during 36 years he was constantly employed on important diplomatic missions in Italy, Switzerland, and Germany. His last mission was at the congress of Münster from 1643 to 1646, as representative of Philip IV. The first edition of his most successful work, *Empresas políticas, ó idea de un príncipe político cristiano*, &c., intended to instruct the infante of Spain, to whom it was dedicated, in the duties of government, appeared at Münster in 1646. He wrote the first two volumes of the "History of the Goths in Spain." His complete works were published at Antwerp in 1683, and a new edition at Madrid in 1789-'90.

FÁY, András, a Hungarian poet, born at Kóhany, in the county of Zemplén, May 30, 1786, died July 26, 1864. He studied law, became an advocate, and subsequently officiated as an administrative officer of the county of Pesth, and in 1835 as its deputy at the diet. His feeble health obliged him to retire, and he thenceforth devoted himself to literature. He was one of the founders of the national theatre of Buda, and was an active member of the industrial society, of the society of arts, of the

academy, &c. Among his poetical writings the most noted is his *Meseik* ("Fables," Vienna, 1820; 2d ed., 1824; German translation by Petz, Vienna, 1821). He wrote two works treating on female education and the social and economical development of Hungary, *Nőnevelés*, &c. (Pesth, 1840), and *Kelet népe nyugoton* (Pesth, 1841). A collection of his works appeared at Pesth in 1848-'4 (8 vols.).

FAY, Theodore Sedgwick, an American author, born in New York, Feb. 10, 1807. He received a liberal education, and was admitted to the bar in 1828, but became soon after one of the editors of the "New York Mirror," and devoted himself to literature. He has published the following works: "Dreams and Reveries of a Quiet Man" (1832); "The Minute Book," a journal of foreign travel; "Norman Leslie," a romance (1835); "Sydney Clifton" (1839); "The Countess Ida" (1840); "Hoboken, a Romance of New York" (1843); "Robert Rueful" (1844); "Ulric, or the Voices," a poem (1851); "Views of Christianity" (1856); "Great Outlines of Geography" (1867); "First Steps in Geography" (1873); and a series of papers on Shakespeare. He was secretary of the American legation in Berlin from 1837 to 1853, and minister resident in Bern, Switzerland, from 1853 to 1861.

FAYAL, one of the Azores or Western Islands, belonging to Portugal, in lat. 38° 30' N., lon. 28° 40' W.; area about 40 sq. m.; pop. about 27,000. The surface is rugged, and in some parts mountainous. The climate is mild and healthful. The soil is in general very fertile. The principal vegetable productions are figs, palms, vines, pineapples, oranges, potatoes, cabbages, maize, and wheat. The chief object of commerce is wine, of which the annual produce is about 200 pipes; and in good seasons from 8,000 to 10,000 pipes, the product of all the islands, have been exported from Fayal. The other most important exports are fruit, especially oranges, and corn. The imports are manufactured goods, cotton twist, flax, coffee, sugar, tea, tobacco, and soap. In 1859 the island was visited by a severe famine, occasioned by the failure of three successive crops. Fayal has the best harbor of all the Azorean group, and a considerable transit trade. Many American whalers touch here and land the oil of such fish as they have caught in their outward voyage, whence it is shipped for its destination. Capital, Horta, or Villa Orta (sometimes improperly called Fayal), a handsome town on the S. E. side of the island, adjoining the harbor before mentioned; pop. 5,000 or 6,000. The steam packets of the British West India mail company regularly call at Horta.

FAYETTE, the name of 11 counties in the United States. **I.** A S. W. county of Pennsylvania, bordering on Maryland and West Virginia, and bounded W. by the Monongahela river; area, about 800 sq. m.; pop. in 1870, 43,284. There are two mountain ridges: one called Laurel hill, stretching along the E.

boundary, and the other known as Chestnut ridge, a branch of the Alleghanies, traversing the central part. The rest of the surface is mostly undulating. The soil is fertile in the N. W. part, but elsewhere is better adapted to pasturage than to tillage. Iron and bituminous coal are abundant. It is intersected by the national road, and accessible by steamboats on the Monongahela. The Pittsburgh and Connellsville railroad passes through it. The chief productions in 1870 were 802,586 bushels of wheat, 22,768 of rye, 824,268 of Indian corn, 633,897 of oats, 79,665 of potatoes, 85,725 tons of hay, 691,623 lbs. of butter, and 287,752 of wool. There were 8,818 horses, 8,404 milch cows, 15,799 other cattle, 65,261 sheep, and 15,852 swine; 20 manufactories of carriages and wagons, 1 of cars, 1 of cement, 4 of bricks, 18 of clothing, 7 of coke, 18 of barrels and casks, 4 of window glass, 9 of iron and products of the same, 8 of machinery, 12 of saddlery and harness, 4 of woollen goods, 1 ship building and repairing establishment, 3 planing mills, 18 saw mills, 7 distilleries, 13 tanneries, 4 currying establishments, and 21 flour mills. Capital, Uniontown. II. A S. central county of West Virginia, bounded N. by the Gauley river, and N. E. by Meadow river; area, 770 sq. m.; pop. in 1870, 6,647, of whom 118 were colored. It has a mountainous surface, with several considerable elevations, the highest of which are Gauley and Sewell mountains. Near the Kanawha or New river, which intersects the county, is a remarkable cliff, 1,000 ft. high, called Marshall's pillar. The scenery of the county is exceedingly picturesque; the soil is generally good, and among the highlands particularly there are many open tracts of remarkable fertility. Iron ore is the principal mineral. The chief productions in 1870 were 18,817 bushels of wheat, 128,220 of Indian corn, 41,991 of oats, 72,188 lbs. of butter, 16,331 of wool, and 188,165 of tobacco. There were 1,317 horses, 2,267 milch cows, 3,036 other cattle, 8,709 sheep, and 6,892 swine. Capital, Fayetteville. III. A W. county of Georgia, bounded S. and E. by Flint river; area, 300 sq. m.; pop. in 1870, 7,988, of whom 1,121 were colored. The surface is mostly level, and the soil, formed by the disintegration of primary rocks, is unproductive. Granite and iron are the principal minerals. The Atlanta and West Point and the Savannah, Griffin, and North Alabama railroads traverse it. The chief productions in 1870 were 25,646 bushels of wheat, 104,496 of Indian corn, 11,916 of oats, and 2,951 bales of cotton. There were 3,587 cattle, 2,241 sheep, and 5,779 swine. Capital, Fayetteville. IV. A N. W. county of Alabama; area, about 550 sq. m.; pop. in 1870, 7,186, of whom 1,077 were colored. It has a moderately uneven surface, drained by numerous streams, and a productive soil. The chief productions in 1870 were 14,266 bushels of wheat, 201,228 of Indian corn, 13,288 of oats, 27,702 of sweet potatoes, 13,194 lbs. of wool, 97,850 of butter,

and 1,909 bales of cotton. There were 1,450 horses, 2,534 milch cows, 5,107 other cattle, 6,354 sheep, and 10,988 swine. Capital, Fayette Court House. V. A S. E. county of Texas, intersected by the Colorado river, which is navigable during half the year to this point; area, 1,025 sq. m.; pop. in 1870, 16,863, of whom 5,901 were colored. The surface is undulating, and the soil, consisting of a black sandy loam, is highly productive. Coal is the most important mineral production. The chief productions in 1870 were 459,392 bushels of Indian corn, 34,206 of sweet potatoes, 144,196 lbs. of butter, 16,280 of wool, and 10,658 bales of cotton. There were 6,650 horses, 10,886 milch cows, 44,593 other cattle, 10,006 sheep, and 17,293 swine; 12 saw mills and 4 manufactories of saddlery and harness. Capital, La Grange. VI. A S. W. county of Tennessee, bordering on Mississippi, and watered by Loosahatchie and Wolf rivers; area, about 550 sq. m.; pop. in 1870, 26,145, of whom 16,987 were colored. It has a fertile, well cultivated soil. It is traversed by the Memphis and Charleston, and its Somerville branch, and the Memphis and Louisville railroads. The chief productions in 1870 were 11,786 bushels of wheat, 627,271 of Indian corn, 26,077 of sweet potatoes, and 20,131 bales of cotton. There were 2,839 horses, 4,073 mules and asses, 4,534 milch cows, 5,277 other cattle, 3,828 sheep, and 80,762 swine; 1 saw mill and 4 flour mills, and 5 manufactories of carriages and wagons. Capital, Somerville. VII. A central county of Kentucky, bounded S. by Kentucky river, and drained by some of its affluents; area, about 300 sq. m.; pop. in 1870, 26,656, of whom 12,513 were colored. It has a rolling surface, and a fertile and well tilled soil, underlying which is an excellent species of building stone called blue or Trenton limestone. The Kentucky Central and the Louisville, Cincinnati, and Lexington railroads pass through it. The chief productions in 1870 were 76,362 bushels of wheat, 42,628 of rye, 1,117,190 of Indian corn, 176,276 of oats, 25,267 of barley, 49,432 of potatoes, 4,899 tons of hay, 157,742 lbs. of butter, and 28,421 of wool. There were 5,522 horses, 2,354 mules and asses, 8,753 milch cows, 12,501 other cattle, 7,477 sheep, and 20,676 swine; 4 manufactories of agricultural implements, 8 of bagging, 3 of boots and shoes, 20 of carriages and wagons, 3 of confectionery, 1 of cotton goods, 2 of furniture, 1 of gas, 1 of malt, 5 of saddlery and harness, 5 of tin, copper, and sheet-iron ware, 2 planing mills, 8 distilleries, and 7 flour mills. Capital, Lexington. VIII. A S. W. county of Ohio; area, 414 sq. m.; pop. in 1870, 17,170. It has a level or undulating surface, and a fertile soil, consisting of deep black loam. It is intersected by the Cincinnati and Muskingum Valley railroad. The chief productions in 1870 were 160,510 bushels of wheat, 2,055,926 of Indian corn, 66,841 of oats, 50,929 of potatoes, 12,015 tons of hay, 861,725 lbs. of butter, and 154,739 of

wool. There were 7,285 horses, 4,889 milch cows, 12,277 other cattle, 84,394 sheep, and 51,955 swine; 2 manufactories of boots and shoes, 10 of bricks, 7 of carriages and wagons, 5 of saddlery and harness, 1 of sashes, doors, and blinds, 1 of woollen goods, 2 flour mills, and 4 saw mills. Capital, Washington. **IX.** A S. E. county of Indiana; area, about 200 sq. m.; pop. in 1870, 10,476. The surface is level or undulating, and the soil fertile. Limestone is the principal rock. The Fort Wayne, Muncie, and Cincinnati, the Cincinnati and Indianapolis Junction, the White Water Valley, and the Columbus, Shelby, and Cambridge City branch of the Jeffersonville, Madison, and Indianapolis railroads intersect it. The chief productions in 1870 were 271,150 bushels of wheat, 685,454 of Indian corn, 56,348 of oats, 26,118 of potatoes, 5,524 tons of hay, 98,874 lbs. of butter, and 31,208 of wool. There were 3,601 horses, 2,631 milch cows, 5,167 other cattle, 8,105 sheep, and 20,879 swine; 2 manufactories of boots and shoes, 11 of carriages and wagons, 8 of furniture, 1 of iron castings, 1 of machinery, 1 of printing paper, 7 of saddlery and harness, 1 of woollen goods, 4 flour mills, and 8 saw mills. Capital, Connersville. **X.** A S. central county of Illinois, intersected by Kaskaskia river; area, 640 sq. m.; pop. in 1870, 19,638. The surface is level, and occupied by alternate tracts of fertile prairie and good timber land. A number of small streams supply it with water power. The Illinois Central and the St. Louis, Vandalia, Terre Haute, and Indianapolis railroads pass through it. The chief productions in 1870 were 851,810 bushels of wheat, 962,525 of Indian corn, 497,895 of oats, 73,845 of potatoes, 20,844 tons of hay, 898,710 lbs. of butter, 54,446 of wool, and 38,155 of tobacco. There were 8,898 horses, 6,261 milch cows, 7,928 other cattle, 21,234 sheep, and 23,817 swine; 11 manufactories of carriages and wagons, 10 flour mills, and 20 saw mills. Capital, Vandalia. **XI.** A N. E. county of Iowa; area, 720 sq. m.; pop. in 1870, 16,978. It is drained by the head branches of Turkey river, is well supplied with water power, and has a healthy climate. The surface is undulating, and occupied partly by fertile prairies and partly by forests. The chief productions in 1870 were 478,588 bushels of wheat, 448,028 of Indian corn, 395,075 of oats, 29,553 of barley, 58,652 of potatoes, 27,327 tons of hay, 454,868 lbs. of butter, and 38,290 of wool. There were 4,901 horses, 5,527 milch cows, 7,646 other cattle, 11,771 sheep, and 14,160 swine; 4 manufactories of carriages and wagons, 2 of barrels and casks, 5 of saddlery and harness, 1 brewery, 10 flour mills, and 13 saw mills. Capital, West Union.

FAYETTEVILLE, a city and the capital of Cumberland co., North Carolina, on the W. bank of Cape Fear river, at the head of natural navigation, 100 m. above Wilmington, and at the terminus of the Western railroad of North Carolina, 55 m. S. of Raleigh; pop. in 1870,

4,660, of whom 2,318 were colored. It is the centre of an active trade, and the seat of manufactures of some importance. The Cape Fear river has been rendered navigable by means of locks and dams as far as the coal mines of Chatham co., and plank roads have been constructed leading to various parts of the interior. The neighboring pine forests furnish large quantities of lumber, tar, and turpentine for exportation. The city contains 10 turpentine distilleries, two manufactories of cotton sheetings, and two national banks. It is governed by a mayor and a board of seven commissioners. It has an academy, a female high school, a colored primary school, two private schools, a semi-weekly and two weekly newspapers, and 25 churches, viz.: 5 Baptist, 3 Episcopal, 8 Methodist, 8 Presbyterian, and 1 Roman Catholic.—Fayetteville was settled in 1762, and before receiving its present name in 1784 was known successively as Campbelltown and Cross Creek. In 1881 it was partly destroyed by fire. The United States arsenal at this point, containing 85,000 small arms besides a number of cannon and a considerable quantity of ammunition, was taken possession of by the confederates, April 22, 1861. The city was occupied by Gen. Sherman, March 11–14, 1865, when the arsenal with the machinery which had been brought from Harper's Ferry was destroyed.

FAYOUM, or **Fayum** (Copt. *Phioum*, the waters), a valley of central Egypt, anciently the Arsinoite nome, about 40 m. S. W. of Cairo, on the W. side of the Nile; length from E. to W. about 40 m., breadth about 80 m.; pop. nearly 150,000. It is of an almost oval form, enclosed by a chain of the Libyan hills, which here bend round to the west and north. It forms in fact a basin with only one opening toward the Nile on the east, and gradually sloping toward the north and south, the northern depression being occupied by the Birket-el-Keroon, long supposed to be identical with Lake Mœris. It is supplied with water from the Bahar Yusef (canal of Joseph), which is divided into numerous branches to irrigate the country. The parts thus watered are remarkably fertile, producing grain, cotton, olives, figs, apricots, and other tropical fruits. Roses are abundant, and the natives produce large quantities of rose water, which is sold all over Egypt. The principal town is Medinet el-Fayoum (anc. *Crocodilopolis* and *Arsinoe*), near which are several broken columns of red granite, carved in old Egyptian style with lotus-bud capitals, supposed to mark the site of the famous labyrinth described by Herodotus. N. of the town Belzoni found two immense stone pedestals, called by the natives Pharaoh's feet, various granite statues, some wrought iron, and a quantity of half melted glass. At some distance stands a syenite obelisk, 43 ft. high and covered with sculptures. About 3 m. from the lake stands a temple known as Kasr Keroon, 94 ft. long, 68 ft. broad, and 40 ft. high, with 14 chambers,

which appears to be of the Roman period. On the S. W. bank of the lake are what are supposed to be the remains of Bacchis. The direction of the principal streets and the ground plans of houses may still be traced.

FAZY, Jean James, a Swiss politician, born in Geneva, May 12, 1796, died Nov. 5, 1878. He completed his education in France, wrote several treatises on political economy, and was connected with journalism in Paris (where his radical opinions involved him in difficulties with the government) and in Switzerland. After his return to Geneva he took an active part in the establishment of a new constitution, and distinguished himself as the principal champion of the introduction of trial by jury, which institution was adopted, Jan. 12, 1844. In 1846 the radicals became exasperated at the neutrality observed by the Genevese government in the conflict between the Catholic and Protestant cantons. A revolution broke out on Oct. 5, a provisional government was established on the 9th, and Fazy, who placed himself at its head, became the ruling spirit of the new grand council of Geneva. The city was embellished under his direction, and he also gave a powerful impulse to the construction of railways and telegraphs. As a delegate of Geneva in 1847 he exerted himself in behalf of the new federal constitution, which was adopted Sept. 12, 1848. From February to December, 1848, he was out of office, owing to disagreement with some of his colleagues; but with this exception he was uninterruptedly at the head of the Genevese government until Nov. 14, 1853. In 1853 he was vice president of the federal council of states, and in 1854 president; and in 1855 he was reinstated in his former position of president of the government of Geneva, but had to resign in November, 1864. Having been indicted as the leader of the riots which took place in August, he fled to France, but returned when the case was abandoned, and obtained once more a seat in the grand council, which he gave up again in 1865, and accepted anew in 1868. He has written *Essai d'un précis de l'histoire de la république de Genève* (Geneva, 1838).

FEATHER GRASS (*stipa pennata*, Willd.), a grass readily distinguishable by its elegant and feather-like awns. It grows in close, matted tufts, having very long, fine, wiry, dark green leaves, numerous tall flower stalks with small florets, succeeded by an abundance of sharp-pointed elliptical grains, each of which is surmounted by the feathered awn or bristle, a foot or more in length. This is of a rich bird-of-paradise color, and gives a remarkable beauty to the plant. Gerarde, a famous herbalist in 1597, informs us that these awned seeds were worn in his time by "sundry ladies instead of feathers." It is this species which is the principal grass in those portions of the steppes of Asia called the *trusa* or pasturing grounds, growing in immense quantities, and developing its woody root stocks above the

soil, much to the annoyance of the mower. The seeds of this beautiful grass are frequently

Feather Grass (*Stipa pennata*).

imported from abroad and sold in our seed shops, but they seldom vegetate.

FEATHER RIVER, a stream rising in the N. E. part of Plumas co., California, which flows S. W. and S. through a rich gold region, and empties into the Sacramento, 80 m. above Sacramento City; length about 180 m. It is navigable as far as Marysville, to which point steamboats ascend from San Francisco. The North and Middle forks, and Yuba river, are its principal tributaries.

FEATHERS, a complicated modification of the tegumentary system, forming the external covering or plumage of birds. Though chemically similar to and homologous with the hair of mammals, their anatomical structure is in some respects different. An ordinary feather is composed of a quill or barrel, a shaft, and a vane or beard consisting of barbs and barbules. The quill, the part attached to the skin, is a hollow cylinder, semi-transparent, composed of coagulated albumen, resembling horn both in appearance and chemical constitution. It is light, but strong, terminated below by an obtuse extremity pierced by an opening, the lower umbilicus, through which the primary nutritive vessels enter; above, it is continuous with the shaft, with which it communicates internally by an opening, the upper umbilicus; the cavity contains a series of conical shrivelled membranes, fitting one upon the other, that have formerly been subservient to the growth of the feather. The shaft is more or less quadrilateral, gradually diminishing in size to the tip; it is always slightly curved, convex above, and the concave lower surface, divided longitudinally by a groove, presents two inclined planes meeting at an obtuse angle; it is covered by a thin horny layer, and contains in its interior a white, soft, elastic substance,

called the pith, which supplies strength and nourishment to the feather. The vane consists of two webs, one on each side of the shaft, each web being formed of a series of laminae or barbs, of varying thickness, width, and length, arranged obliquely on the shaft, and composed

of the same material; their flat sides are placed close to each other, enabling them to resist any ordinary force acting in the direction of their plane, as the impulse of the air in the act of flight, though yielding readily to any force applied in the line of the shaft. The barbs taper to a point, but are broad near the shaft, and in the large wing feathers the convexity of one is received into a concavity of another; but the barbs are kept in place chiefly by barbules, minute curved filaments arising from the upper edge of the barb, as the latter does from the shaft; there are two sets, one curved upward and the other downward, those of one barb hooking so firmly into those of the next as to form a close and compact surface; in the ostrich the barbules are well developed, but are long, loose, and separate, giving that soft

FIG. 1.—Parts of the Feather.

1. The quill. 2. The shaft. 3. The vane or beard. 4. The accessory plume. 5. The lower umbilicus. 6. Upper umbilicus.

character conveyed by the term plume. The barbules are sometimes provided with a similar apparatus on their sides called barbicels, as in the quills of the golden eagle and albatross; these serve to keep the barbules in position, but are less numerous than the latter. In most feathers there is an appendage near the upper umbilicus of a downy character, called the accessory plume; small in the quills of the wings and tail, in some body feathers of hawks, ducks, and gulls it is of large size, in some species as large as the feather which supports it; in the emu two plummy feathers arise from one quill, and sometimes three in the cassowary, the additional plumes being these accessory feathers; in the ostrich there is no such additional tuft. There is, therefore, every gradation from a simple barrel and shaft, as in the cassowary's quill, to the feather with barbs, barbules, and barbicels. Some feathers are all downy, like the abdominal ones of the eagle-owl; others have very little down, as the harsh plumage of the penguin; in the eider duck, and other arctic species, there is at the base of the common feathers a soft downy covering, securing warmth without weight, like the soft fur at the base of the hair of arctic mammals; young birds are covered with down before the development of feathers, the latter being guided through the skin by the former. In the chick the formation of down

begins on the eighth day of incubation, and is continued until the hatching; 10 to 12 radiating filaments are formed at the same time in an epidermic sheath, which soon after birth dries and sets free the plumes, allowing them to spread out as a pencil of down; a stem is developed, and the downy filaments become the primary web of the feather. Feathers in some cases resemble stiff bristly hairs, as about the bill in most birds, and the tuft on the breast of the wild turkey. In the genus *dasylophus*, peculiar to the Philippine islands, we have remarkable instances of the modifications of the epidermic covering of birds. In *D. Cumingii* (Fras.), the feathers of the crest, breast, and throat are changed at their extremities into ovoid horny lamellae, looking like shining black spangles, expansions of the true horny structure of the shaft; something of the kind is seen in the Bohemian chatterer or wax-wing (*ampelis garrulus*, Linn.), in which some of the secondary and tertial quill feathers end in small, oblong, flat appendages, in color and consistence resembling red sealing wax, which are also expanded horny prolongations of the shafts of the ordinary feathers. In *D. superciliosus* (Cuv.), the only other species of the genus, the feathers over each eye are changed for three fourths of their length into red silky hairs or bristles, the base of the feather having the usual appearance; each shaft seems to divide into several of these hair-like filaments, which are finer and more silky than the appendage on the breast of the turkey, and directly continuous with ordinary feather structure, while in the turkey there is a complete transformation of feathers into hairs in the whole extent. In most birds there will be found a number of simple hair-like feathers scattered over the skin after they have been plucked; they arise from short bulbs or slender rounded shafts. Feathers are developed in depressions in the skin lined by an inversion of the epidermis which surrounds the bulb; they grow by the addition of new cells from the bulb, which become modified into the horny and fibrous stem, and by the elongation and extension of previously formed cells; like the hair, they originate in follicles producing epidermic cells, though when fully formed the cellular structure is widely departed from except in the medullary portion. They are, when first formed, living organized parts, developed from a matrix connected with the vascular layer

FIG. 2.—Matrix of a growing Feather, laid open.

1. 1 Capsule of the matrix. 2. 2 External membrane. 3. 3 Matter of the vane. 4. Internal membrane. 5. Bulb or medulla.

of the skin, and growing by nutrient vessels; when fully developed, the vessels become atrophied, and the feathers dry and gradually die from the summit to the base, so that at last they become dead foreign bodies, as completely incapable of vital modifications as the perfect



FIGS. 3 AND 4.—Structure of the Bulb.

FIG. 3.—1, 1. Bulb. 2. Part of the bulb in process of drying up as the shaft forms. 3. Part of the completed shaft. 4, 4. Growing barbs.

FIG. 4.—1. The medulla or bulb. 2, 2, 3, 3, 4, 4, 5, 5. Membranous cones, indicating stages of growth of the medullary matter.

horns of the deer. The matrix which produces the feather, according to Owen, has the form of an elongated cylindrical cone, and consists of a capsule, a bulb, and intermediate membranes which give proper form to the secretion of the bulb; as the conical matrix sinks into and becomes more intimately connected with the true skin, its apex protrudes above the surface, and the investing capsule drops off to give passage to the feather which has been growing during this period; the capsule is made up of several layers, the outermost consisting of epidermic cells, and its centre is occupied by a soft fibrous bulb freely supplied with blood vessels from below and a nerve; between the bulb and the capsule are two parallel membranes, in whose oblique septa or partitions the barbs and barbules are developed, nearly in the same way that the enamel of the teeth is formed

between the membrane of the pulp and that of the capsule. The part to which the barbs are attached and the pith of the shaft are formed respectively from the outer and inner surfaces of the membranes of the compound capsule; the shaft and barbs at the apex of the cylinder become hardened first, and are softer the nearer the base of the matrix; the first formed parts are pushed forward by the cell growth at the base, the products of the bulb being moulded into shape by the membranes exterior to it; the successive stages of the growth of the medullary matter are indicated by a series of membranous cones or caps, the last formed of which cannot escape from the hardened and closed shaft, and constitute the light dry pith seen in the interior of the quill; these cones are originally connected together by a central tube, and the last remains of the bulb are seen in the ligament which passes from the pith through the lower umbilicus, attaching the quill to the skin. Feathers grow with great rapidity, and in some birds to a length of more than two feet; they are almost always renewed annually, and in many species twice a year; this amount of formative power demands a considerable increase of the cutaneous circulation, making the season of moulting always a critical period in the life of a bird. The plumage is generally changed several times before the bird is adult; but some of the falcons are said to assume the mature plumage after the first moult, as the Greenland and Iceland falcons.—Feathers serve to protect birds from injurious external influences, such as extremes of cold and heat, rain, &c., for which their texture and imbricated arrangement admirably adapt them; and they also furnish their principal means of locomotion, in the latter case being stronger, more compact, and longer than those which cover the body. They generally increase in size from the head backward, and have received special names according to the region of the body, which are important aids in describing and recognizing species. Some of these names, constantly used in the ornithological articles of this Cyclopædia, not readily understood from the words themselves, are as follows: the scapulars, above the shoulder blade and humerus, apparently on the back when the wing is closed; axillaries, long and straight feathers at the upper end of the humerus, under the wing; tibials, covering the leg; lesser wing coverts, the small feathers in rows upon the forearm; under coverts, lining the lower side of the wings; the longest quill feathers, arising from the bones of the hand, are the primaries; the secondaries arise from the outer portion of the ulna, and the tertiaries from its inner portion and the humerus; the bastard wing consists of the quills growing from the rudimentary thumb; greater wing coverts, the feathers over the quills; tail coverts, upper and under, those above and below the base of the tail feathers. The relative size of the quills on the hand and forearm, and the consequent form of the wings, are characteristic of

FIG. 5.—Section of the Shaft and Vane magnified.

1. The pith. 2. Horny external surface of shaft. 3. Concave internal surface. 4. Flat side of shaft. 5, 5. Bases of barbs. 6, 6. Barbules.

the families of birds, and modify essentially their powers of flight. The breadth of the wing depends principally on the length of the secondary quills, and its length on that of the primaries. Leaving out of view the proportions of the bones and the force of the muscles of the wings, when the primaries are longest at the extremity of the pinion, as in the falcons and swallows, causing an acuminate form of wing, we may know that the powers of flight are great, requiring comparatively little exertion in the bird; but when the longest primaries are in the middle of the series, giving rise to a short, broad wing, as in the partridge and grouse, the bird can fly only a short distance at a time, with great effort, and a whirl well known to the sportsman. Not only the shape of the wing, but the close texture of its feathers, must be taken into account in the rapid strong flight of the falcon; the loose soft feathers of the wings in the owls, and the serrated outer edge of the primaries, while they prevent rapid flight, enable them to pounce noiselessly upon their vigilant prey.—Most birds, and especially the aquatic families, are provided with an oil gland at the base of the tail, whose unctuous secretion is distributed over the feathers by means of the bill, protecting their surface against moisture; the shedding of the water is not owing entirely to the oily covering, but also to a thin plate of air entangled by the feathers, and probably also to an actual repulsion of the particles of water by the feathers, as is seen in the leaves of many aquatic plants; the arranging of the plumes by the bill of the bird being rather to enable them to take down a large quantity of air, than to apply any repellent oily covering.—The plumage of birds has an infinite variety of colors, from the sombre tints of the raven to the pure white of the egret, and the gorgeous hues of the lory, toucan, trogon, and humming birds; the females have generally less lively colors, and the summer livery of both sexes is often different from that of winter. One of the most curious phenomena connected with feathers is the annual moult, and the change of color during that and the breeding season; moulting usually takes place after the young have been hatched, the whole plumage becoming dull and rough, and the bird more or less indisposed, with a temporary loss of voice in the singing species. According to Mr. Yarrell, the plumage of birds is changed by the mere alteration of the color of the feathers; by the growth of new feathers without the loss of any old ones; by the production of new feathers in the place of old ones thrown off, wholly or in part; and by the wearing off of the light tips as the breeding season approaches, exposing the brighter tints underneath. The first two of these changes occur in adults at the end of spring, the third being partial in spring and complete in autumn. Though the perfect plumage is non-vascular and epidermic, the colors change, probably by some vital process, without the loss of a feather; when the winter livery succeeding the autumnal

molts begins to assume its bright characters, the new color generally commences at the part of the web nearest the body, and gradually extends to the tip. Until within the last few years the changes of color in the fur of mammals (as in the ermine in winter), and in the plumage of birds in the season of reproduction, were supposed to be effected by the simple reproduction of the hairs and feathers; but this cannot be the case, as many facts go to prove that these changes occur at other times than the period of moulting, and without the loss of a hair or feather. It is well known that vivid emotions of fear or grief may turn the human hair gray or white in so short a period that there could be no change in the hair itself to account for it; and a case is on record of a starling which became white after being rescued from a cat. It has been maintained by Schlegel and Martin that many birds always get their wedding plumage without moulting. The fact being admitted, how can the change of color be explained in the mature feather, which has no vascular or nervous communication with the skin? The wearing away of the light tips, mentioned by Mr. Yarrell, is not only unphysiological, but in most cases does not happen. Dr. Weinland, from the examination of bleached specimens in museums, and of recent birds, expresses the belief that the brightness and fading of the colors are owing to the increase or diminution of an oily matter in the feathers; the microscopic examination of the web of feathers from the breast of a fresh merganser (*mergamus serrator*, Linn.) showed numerous *lacuna* of a reddish oil-like fluid; some weeks after, the same feathers, having become nearly white from exposure to light, disclosed air bubbles instead of the reddish fluid; from this he concludes that the evaporation of the oily fluid, and the filling of the spaces with air as in the case of the white water lily, produces the changes of color. If this fluid be oily, as there is good reason to believe, mere physical imbibition would be sufficient to introduce it into the dead feathers, as it is well known that fat passes through all tissues very readily, even through compact horn. In the season of reproduction, the nutritive and organic functions are performed with their utmost vigor, and the supply of fatty coloring matter would flow freely to the feathers; under the opposite conditions of debility, cold, or insufficient food, the oily matter would be withdrawn and the feathers would fade.—In regard to the value of feathers to man, it will be sufficient to enumerate the ornamental employment of the plumes of the ostrich, egret, cranes, and peacock; the economical uses of the down of the eider duck and the plumage of the goose; the importance of the goose quill before the introduction of steel and gold pens, and the adherence of many at the present day to the more perishable, less convenient, but softer-moving quill; not to more than allude to the consumption of the plumage of the gorgeous tropical birds in the

manufacture of feather flowers, and the utility of the downy arctic skins as articles of dress in the regions of perpetual snow.

FEBRUARY (Lat. *Februarius*, from *februare*, to purify; so called from *februa*, the festival of expiation and lustration, which was held on the 15th of this month), the second month in our present calendar, containing 28 days ordinarily, and 29 days in leap year. It was not in the calendar of Romulus. Numa added two months to the year, January at the beginning and February at the end. It was first placed after January by the decemvirs about 450 B. C.

FÉCAMP (formerly *Fescau* or *Fescamp*; Lat. *Fiscamum* or *Fiscamnum*), a seaport town of France, in the department of Seine-Inférieure, 23 m. N. N. E. of Havre, on a branch railway from Rouen, and at the entrance of the river Fécamp into the channel; pop. in 1866, 12,832. The town has two remarkable churches, a hydrographical school, a library, a theatre, a commercial court, a chamber of commerce, and extensive sea-bathing establishments. The chief occupations of the inhabitants are fishing, ship building, and commerce, but its manufactures are also becoming important. The town is believed to owe its origin to a celebrated female convent which was founded about 662. It has repeatedly been destroyed in times of war. As early as the 18th century it was famous for its herring fisheries.

FECHNER, Gustav Theodor, a German naturalist, born at Gross-Sährhen, Lusatia, April 19, 1801. He studied at the university of Leipsic, and was professor of physics there from 1834 to 1839, when a disease of the eyes disabled him from teaching, and he devoted himself especially to anthropology and natural philosophy. He had early attracted attention by researches in galvanism, by translations of French scientific works, by papers relating to chemistry and pharmacy, and by humorous writings, *Stapelia mixta*, which he published in 1824 under the name of Dr. Mises. In his *Beweis, dass der Mond aus Jodine besteht* (2d ed., 1832) he deals with scientific problems in a humorous vein. His *Büchlein vom Leben nach dem Tode* (1836), *Gedichte* (1842), and *Räthselbüchlein* (3d ed., 1865) contain admirable specimens of poetry. His other principal works are: *Nanna, oder über das Seelenleben der Pflanzen* (1848); *Zend-Avesta, oder über die Dinge des Himmels und des Jenseits* (3 vols., 1851); *Elements der Psychophysik*, his most important scientific work (2 vols., 1860); and *Physikalische und philosophische Atomentelehre* (2d ed., 1864).

FECHTER, Charles Albert, a French actor, born in London, Oct. 28, 1824. The son of a German father and a French mother, he was reared principally in England and France, and after a good education he began in Paris the study of sculpture. Manifesting a strong inclination for the stage, he made his first appearance while still very young at the Salle Molière in *Le mari de la coiffe*. After some

weeks at the conservatory, he joined a company of French comedians for a year's tour through Italy. Returning to Paris, he again applied himself to sculpture, at the same time playing minor characters in the Théâtre Français. His first great success was in 1846 in the French theatre at Berlin, where he appeared as the original Duval in *La dame aux camélias* of Dumas the younger. In 1847 he played for a few weeks with a French company in London, and afterward till 1858 at different times he was prominent on the boards of the theatres Ambigu, Variétés, Historique, Porte Saint-Martin, and Vaudeville in Paris. From March, 1857, to the end of 1858, he was joint manager with M. de la Rounat of the Odéon. Two years afterward he was induced to undertake characters in English on the London stage, and on Oct. 27, 1860, he opened at the Princess's theatre as Ruy Blas in his own version of Victor Hugo's play. On March 19, 1861, he appeared as Hamlet, playing the part in a flaxen wig and making other marked innovations upon the costume and conventionalities of the character. He played the part 70 successive nights, and excited an animated discussion among the London critics. He followed with Othello, Iago, Macbeth, Coriolanus, the "Corsican Brothers," Claude Melnotte, and other characters, in nearly all of which he achieved a remarkable success, in spite of his disregard of the traditions and conventionalities of the English stage. He leased the Lyceum, Jan. 1, 1863, opening as Legadere in "The Duke's Motto," and continued his management of that theatre for some years. He made his first appearance in America as Ruy Blas, in Niblo's theatre in New York, Jan. 10, 1870. In October following he opened the Globe theatre in Boston as manager, but soon returned to New York, and after a brief engagement at the French theatre, where he played several characters in English, he went back to London. Returning to New York in 1872, he leased the French theatre, and remodelled it; but failing to secure possession of the property, he made his first reappearance in New York, April 28, 1873, at the Grand Opera House, as Edmond Dantes in his own version of "Monte Cristo."

FEDCHENKO, Alexei, a Russian naturalist, born about 1830, died near the summit of the Col du Géant, Switzerland, Aug. 14, 1873. He resided at Moscow, and was a high authority on the geography of central Asia. He went to Switzerland to compare the glaciers of Mont Blanc and the Col du Géant with those which he had discovered in the mountains of Khokan. He left Montreux on foot for Chamouni Aug. 12, and on the 14th proceeded to the Col du Géant with two guides. He had gone within about two hours' walk of the summit when a violent storm and avalanches of snow forced him to retrace his steps, and he fell from exhaustion and perished. He left unfinished an important work, which his wife, who ac-

accompanied him in all his journeys, though not in this ascent, designs publishing.

FEDERALISTS, a political party in the United States who claimed to be the peculiar friends of the constitution and of the federal government. Their opponents, the republicans, they called anti-federalists, and charged them to a certain extent with hostility to or distrust of the United States constitution and the general government. The republicans, however, strenuously denied the truth of these charges. The federalist party was formed in 1788. Its most distinguished leaders were Washington, Adams, Hamilton, Jay, and Marshall; and the leading federalist states were Massachusetts and Connecticut, supported generally, though not uniformly, by the rest of New England; while Jefferson, Madison, Monroe, Burr, George Clinton, and Gallatin led the opposition. In the contests of the French revolution the federalists leaned to the side of England, the republicans to that of France. The former were defeated in the presidential election of 1800, when the republican candidates were elected, Jefferson president, and Burr vice president. Their opposition to the war of 1812, and above all the calling of the Hartford convention, completed their destruction as a national party. In 1816 Monroe, the republican candidate for president, received the electoral votes of all the states with the exception of Massachusetts, Connecticut, and Delaware, which gave 84 votes against him, while from the other states he received 183. At the next election in 1820 the federalist party was disbanded, Monroe receiving every electoral vote except one.

FEDOR. See **FEODOR**.

FEE, a law term, derived probably from Sax. *feh*, or more accurately *feoh*, compensation or payment. As landed estates were given by the northern conquerors of the Roman provinces to their nobles and soldiers as compensation or wages for military service, fee came to mean the estate itself. It was Latinized into *feudum* or *feodum*, from which the word feudal arose, because it was this tenure of land which characterized what is called the feudal system. The derivation and original meaning of this word are not certainly known, but what we have given is, we think, supported by the best reasons. In law, estate does not mean the land, but the title which a man has in the land; so the word fee is now used to signify, not the land, but the kind of estate or tenure by which it is held. The word fee alone means an estate without qualification or limitation; hence the phrase fee simple means the highest estate held of any superior or lord, or by any tenure or service, or strictly speaking, by any tenure whatever; and the word simple means only that nothing is added to limit or condition the word fee. Hence an estate in fee and an estate in fee simple are the same thing. This is an absolute estate of inheritance; or an estate which a man holds, descendible to his heirs for ever. There is no event by which it

must be terminated or defeated, and no limitation or restriction by force of which it must descend to a certain heir or heirs, in exclusion of the rest. A fee simple may be acquired by descent or by purchase. In law, purchase means every mode of acquiring land except descent; hence if land be given to a man, or devised to him, and he takes by gift or by devise, still he is said in law to take by purchase. The essential words in any instrument by which a man should take land in fee, whether by will or deed, are, to the grantee, or devisee, and "his heirs." For if land be given to a man without the word "heirs," he takes only an estate for his own life, and at his death (if there be no remainder over) it reverts to the grantor or his heirs; and at common law there are no words which could supply the want of these "words of inheritance," as they are called, where there could be heirs. Thus, if land were conveyed or devised to a man "and his successors," he took only an estate for life; but if these words were used in a deed or devise to a corporation, they were the proper words to create a fee simple, because a corporation should have perpetual succession, but cannot have heirs. If land be granted or devised to A, B, and C, as trustees, then also the word successors would in general carry a fee. The ancient severity of the rule requiring words of inheritance is now relaxed somewhat in England, and more in the United States (in some of the states by statute), especially in respect to wills and trusts. In wills, any words distinctly indicating the purpose of the testator to devise all his estate and interest in a piece of land, are always held now to carry a fee simple; and in trusts, if one has land given to him with power to sell, this is held to be a power to convey in fee simple. In deeds it is always better to add the words of inheritance, but the word "assigns" is not necessary to give the power of transfer, although usually added. There may be a fee simple not only in lands, but in franchises and liberties; and in England, in dignities and the rights and privileges attached to them; and even in personal property, as in an annuity.—Fees may be less than fee simple, and they are so whenever not simple; that is, whenever the fee is in any way restrained or diminished. A qualified fee, technically so called, is one in which, by an original limitation, the land goes to a man and his heirs general, and yet is not confined to the issue of his own body; as if it be given him and to his heirs on the part of his father or a certain ancestor. A determinable fee is a fee which may continue for ever, but which may be determined by the happening of some event which is uncertain. Instances usually given of this are lands conveyed or devised to a man and his heirs until an infant shall attain a certain age, or until such a person shall be married, or shall have children. A conditional fee means either a fee to which at its origin some condition was annexed, which being

performed will defeat the estate, or the performance of which is necessary to preserve the estate, or the performance or occurrence of which is necessary to vest estate. But these three phrases are not definable with exact accuracy, and are sometimes used one for the other. Fee tail is a law term of more precise meaning. It is derived from the Norman French word *tailleur*, to cut, because it is a lesser estate of inheritance cut or carved out of the fee simple; and it exists where a conveyance or devise is made to a person named and the heirs of his body or some specified class of the heirs of his body, as for instance the heirs male or heirs female of his body, or the heirs of his body begotten of his then wife. The difference between this and a fee simple is at once perceived, for while the latter on the owner's death will pass by descent to his heirs general, who may be collateral relatives, the former will descend only in the line indicated by the instrument creating the estate. Formerly the understanding was that the grantee of an estate tail had only a life interest, and could convey no more; but afterward means were devised by which he might convey a fee, and this in the hands of his grantee would necessarily be a fee simple. The usual mode of doing this was the process of suffering a common recovery, but by statute 3 and 4 William IV., c. 74, the same result may be accomplished by an ordinary deed of conveyance duly enrolled. Legislation of a similar nature has also been adopted for Ireland and Scotland. In the United States estates tail have had no practical existence since the revolution. In some of the states they are wholly unknown. In others they become at once, by force of statutory provisions, estates in fee simple. In others a tenant in fee tail bars the entail by a simple conveyance in fee simple. In yet others, and they are numerous, they are simply abolished by statute, without any reservation whatever.

FEEJEE (Fiji, or Viti) ISLANDS, a group in the South Pacific ocean, between lat. $15^{\circ} 30'$ and $20^{\circ} 30'$ S., and lon. $176^{\circ} 50'$ E. and $178^{\circ} 20'$ W. Feejee is the name in the windward, and Viti in the leeward part of the group. There are some 225 islands, of which about 140 are inhabited. The population is estimated at 250,000, of whom 4,000 are whites. Viti Levu, or Naviti Levu, is the largest and most populous of the group; it is about 64 m. from N. to S. and 97 from E. to W. Suva harbor is free from shoals, well sheltered, and of easy ingress and egress. The best known towns on this island are Namena, Ndawasamu, Tova, Nakorotubu, Rakiraki, Tavua, Mba, Namoli, Nandy, Vunda, Vitogo or Veitiri, Mbetarau, Nandroga, Ndeumba, and Suva. Vanua Levu (Great island), generally called Vuya by its inhabitants, ranks next to Viti Levu, and is 69 m. N. of Bau, a small island on the E. side of the latter, from which distances in the group are reckoned; it is 115 m. long from E. N. E. to W. S. W., and on an average 25 m. broad.

The principal towns of Vanua Levu are Mbua, Ndama, Navave, Solevi, Navatu, Nasavusavu, Undu, Namuka, Mathuata, Raviravi, and Wailea. The bay of Nasavusavu, 10 m. long by 5 broad, is surrounded by very high and broken land, rising in many places into lofty needle-shaped peaks; behind them several other high peaks reach to about 4,000 ft. A considerable stream of fresh water enters the bay, and a mile below on the beach are hot springs, which are continually steaming. The rock in the neighborhood is compact coral and volcanic breccia. The water has a faint smell of sulphur and a strong saline taste. The natives use the springs to boil their food, which is done by covering them with leaves and grass, when rapid ebullition ensues in the previously quiescent water. Tavuni, commonly but erroneously called by the white residents Vuna or Somosomo, is the third island in size and importance; it is about 24 m. long and 9 m. broad, and 5 m. S. E. of Vanua Levu. The whole island is one vast mountain, 2,052 ft. high, and very fertile. On the top is a lake containing an abundance of large eels. The principal towns on it are Somosomo, Vuna, Weilangi, Wainikeli, and Mbouma. Kadavu or Kandavu is a large, populous, and well wooded island, 69 m. S. S. W. of Bau and 48 m. from the nearest point of Viti Levu; it is 32 m. long, and averages 4 m. in breadth. On the west is a small bay, Malatta, which offers temporary anchorage, but it is difficult to enter on account of reefs. Westward of Malatta is Tavutha bay, frequented by whalers. E. of Kadavu, and between it and the island of Ono, is a well protected harbor. The Mbukileru mountain is very high. Another populous island is Gan or Ngau, 18 m. long and 4 broad, 38 m. E. of Bau. The reef extends a mile and a half off the N. E. point, and several miles off the S. side, but is close to the island on the east, where there are several openings, but none fit for anchorage. There is good holding ground in the bay opposite the town of Lakemba. Other towns on this island are Sawayake (the chief town), Nakumbuna, Nawaikama (at which there are hot springs), Nakorowaro, Levuka, Ourata, Nathavanandi, Lekanai, Nggarani, and Vioni. Koro (meaning "a town") is a very fine island, $9\frac{1}{2}$ m. long by 4 wide, 59 m. N. E. of Bau, with an anchorage on the N. W. side. The chief towns are Wailevu or Sithila, Tangandenga, Thawalevu, Nasau, Waitaya, and Korolailai. Moala, a high volcanic island, about 4 m. wide by 8 long, 86 m. E. S. E. of Bau, has several towns, among them Navathunimasi and Thakova. The reef on the N. side of Moala is a collection of sunken and detached patches; that on the N. E. extends $2\frac{1}{2}$ m.; to the westward are several passages through the reef, quite safe with a favorable wind. Ovalau, a mountainous island about 20 m. from Bau, 8 m. long N. and S., and 7 m. broad, is of volcanic formation, and its rocks are composed of a conglomerate.

erate or pudding stone. The valleys extend only a short distance into the interior and have little level ground; they are exceedingly fertile, with a deep, rich soil, and well cultivated. Its harbors are all formed by the reefs. Levuka, a town on the E. side of the island, is chiefly inhabited by foreigners. It is the seat of the Feejeean government, the residence of foreign consuls, the principal shipping port, and has several hotels, churches, and stores. The metropolis of Feejee, containing upward of 1,000 inhabitants, is Bau, or Mban, on the small island of the same name, which is connected with the large island Viti Levu by a long flat of coral, fordable at high water, and in places bare at low water. Lakemba, or Lakeba, is the principal island on the windward side of the group, 160 m. E. S. E. of Bau; the chief town is Tumbou. Other inhabited islands are Batiki or Mbatiki, Beqa or Mbeng-ga, Cakaudrove-i-wai or Thakaudrove, Cikobia or Thikombia, Kabara or Kambara, Komo, Macuata or Mathuata, Malolo, Nairai, Nayau, Ogea or Ongea, Oneata, Rewa, Vanua Balavu or Mbalavu, Vulaga or Vulanga, often called Fulanga, and Yacata or Yathata.—From the meteorological register kept at Levuka by Col. W. J. Smythe, from January to the end of April, it appears that the maximum heat amounted on the 1st of January to $91^{\circ} 9'$, and that the minimum temperature on the 8th of April was 72° . The average rain during these four months was 17.29 in.; thunder was heard almost daily, while the wind was generally very light. Thomas Williams places the mean temperature of the group at 80° . There is a large number of rainy days, but uninterrupted dry weather often continues for two or three months. Among the botanical productions are numerous varieties of the *dioscorea* or yam, called *uvi*; the balabala, a kind of palm or tree fern, of which the heart is eaten in times of scarcity; the bau, with an edible fruit and a beautiful brown or red wood, used for canoes and boxes; the bele, of which the leaves are cooked and eaten; the bokoi, which has a fruit scarcely distinguishable from the kavika, a kind of Malay apple tree with a quince-like fruit; the bovu-dama, which furnishes a heavy timber of a light color; and the bulou, with a root resembling in taste an old potato. There is an elegant variety of fern called *conini*. The dalici bears spike-shaped flowers, and yields a hard and useful timber; but the most useful tree for canoe building, masts, and all kinds of carpentry, is the damanu. A fruit somewhat like a plum is borne by the dawa and the dawamoli. Bread is made from the fruit of the dogo and the dogokana. The wood of the duva, pounded into fibres and fastened to a line, poisons or stupefies fish, which turn on their back as if they were dead, but soon recover when left to themselves. The fruit of the ivi is either baked or boiled, or grated and made into bread or pudding. The leaves of the danidani and

the kura are used medicinally. The smaller branches of the loselose are used by the natives as torches. But the most important of all the botanical productions is the cocoanut tree, here called *niu*, almost every part of which is put to some use. Drums are made of the wood of the tavola; fans and umbrellas from the leaves of the viu, a kind of palm. A fruit very much like the raspberry is obtained from the wagadrogadro. The root of the lagona (*piper mythisticum*) is chewed and mixed with water and drunk as a beverage. The bitu and the bituvatu are kinds of bamboo which grow extensively. Cotton has succeeded admirably, and can be harvested within six months. Many of the colonists are planting coffee. Fishes are plentiful, including the porpoise, sole, mullet, and many other edible kinds; also a large shark, called *mego*, and a still more dangerous fish called *ogo*. A kind of sea worm called *babolo*, found on some reefs toward the latter part of the year, is much esteemed by the natives as food. A maggot called *yavato*, which bores into wood, is much eaten on the poor islands. There are several kinds of oyster (*civa*), of which the large pearl shell is ground and used for ornaments. The coqe, a sacred bird, has a singular cry, much like a dog's or the human voice. There is a small bird somewhat like a corn-crake, called *bici*; a vampire bat, called *beka*; a large sea gull, called *kasaga*; the kitu, a bird destructive to the sugar cane; the kulu, a species of red parrot, whose feathers are much valued for fringes of mats and personal ornaments; the sacred lawedua, a sea bird with two long feathers in its tail; owls, hawks, pigeons, &c. From a pair of horses introduced in 1851 all the mission stations have been supplied. Some islands of the group are much troubled with mosquitoes.—The natives are above the middle height, sleek and portly, with stout limbs and short necks. They are of darker complexion than the copper-colored and lighter than the black races. Their hair is black, long, frizzled, and bushy, sometimes encroaching on the forehead and joined by whiskers to a thick round or pointed beard, to which moustaches are often added. They are almost free from tattooing; only the women are tattooed, and that on the parts of the body which are covered. The men dress in a sort of sash of white, brown, or figured *masi*, using generally about six yards, though a wealthy man will wear one sometimes nearly 300 ft. long. The women wear a *liku* or fringed band, made of the bark of a tree, the fibre of a wild root, and some kinds of grass; the fringe is from 8 to 10 inches deep. The turban, worn only by the men of the respectable classes, is a fine *masi* of one thickness, and has a gauze-like appearance. They bore the lobe of the ear and distend the hole, and wear enormous ear ornaments. Both sexes paint their bodies, and seem to prefer red; they also besmear themselves with oil. The hair is the most important part of the toilet, and is dressed in gro-

teeque forms, sometimes attaining a diameter of 5 ft. The chief's barber is held in high respect, and his hands are not allowed to touch food. The hair is colored sometimes with two or more dyes. They are fond of music, and have invented the nose flute, the conch shell, the pandean pipes, a jewsharp made of a strip of bamboo, and several sorts of drums. The singing is invariably in a major key. The musicians perform on one note, the base alternating with the air; they then sound one of the common chords in the base cleff without the alternation. The natives love to dance and are fond of poetry. Their verses occasionally rhyme, but seldom preserve a uniform measure. In chanting the chorus is repeated at the end of each line. Girls are betrothed at a very early age, and often to old men. Brothers and sisters, first cousins, fathers and sons-in-law,

the supreme chief touches. He works sometimes at agricultural labor or plaits sinnet. He has always several attendants about his person, who feed him and perform the most servile offices. He has no throne, but squats on the ground like his subjects. A peculiar language is used when speaking of the chief. All his actions and the members of his body are hyperbolized. Respect is indicated by the utterance of a peculiar shout or chant called *tama*; this is uttered by inferiors on approaching a chief or chief town. It is necessary to crouch when a chief passes by. Standing in the presence of the chief is not allowed, and all who move about the house in which he is creep, or, if on their feet, advance bent, as in act of obeisance. No one may cross a chief behind his back; the inferior must pass in front of the superior, and when at sea must not pass the canoe of a chief on the outrigger side. If a chief stumbles or falls, his subjects must do the same. The best produce of the gardens, the best animals, and the best fish are presented to the chiefs. Pay day of taxes is regarded as a high festival. Whale's teeth, women, and canoes are prominent articles of tribute. The criminality of an act is in inverse proportion to the rank of the offender. Murder by a chief is less heinous than petty larceny by a man of low rank. The most serious offences are theft, adultery, abduction, witchcraft, infringement of a taboo, disrespect to a chief, incendiarism, and treason. Theft is punished by a fine, repayment in kind, loss of a finger, or clubbing. The contumacious are punished by a fine, or loss of a finger, ear, or nose. The other crimes are punished by death, the instrument being the club, noose, or musket. Adultery is the crime most severely visited. The adulterer may be put to death, or he may be compelled to give up his own wife to the aggrieved man, or his property may be destroyed or taken away from him. The principle of vicarious atonement is acknowledged. A man sentenced to death will often surrender his father to suffer in his stead. There is also a species of pecuniary atonement called *soro*, of which there are five varieties; the *soro* with a whale's tooth, a mat, club, musket, or other valuable, is the most common. Society is divided into six recognized classes: 1, kings and queens; 2, chiefs of large districts or islands; 3, chiefs of towns, priests, and ambassadors; 4, distinguished warriors of low birth, chiefs of the carpenters, and chiefs of the turtle catchers; 5, common people; 6, slaves by war. Rank is hereditary through the female line. The dignity of a pagan chief is estimated by the number of his wives. The rights of the *sasu*, or sister's son, constitute one of the peculiar institutions of Feejee. A *vasu* of rank can claim anything in his mother's land, excepting the wives, home, and land of a chief. In the moral and intellectual state of the Feejeeans there is a wide distinction between the pagan and Christian natives. As the majority are pagans, their customs, laws, and religion may

A Feejeean.

mothers and daughters-in-law are forbidden to speak to each other or to eat from the same dish. The latter prohibition extends to husbands and wives. The common people usually take two meals a day, the chief three or more. As they abhor drinking after each other from the same cup, they hold the vessel about ten inches above the mouth, and pour the stream down the throat. They eat with their fingers. Rheumatism is common; they relieve the patient by making deep incisions over the part affected. The law of descent is curious. The successor of a chief is his next brother, failing whom, his own eldest son or the eldest son of his eldest brother fills his place; but the rank of the mother often causes an infraction of this rule. The person of a pagan high chief is *taboo* or sacred. In some cases they claim a divine origin. Everything becomes consecrated which

still be regarded as the national standards of Feejee. Capt. Wilkes says of them: "They are truly wretches in the strongest sense of the term, and degraded beyond the conception of civilized people." Strangulation of women, especially widows, infanticide, and other enormities prevail to a frightful extent. Foremost among their describable vices stands cannibalism; not only are prisoners taken in war consumed, but persons of the same tribe and village fall victims to the greed of their neighbors. The cooked human body is termed in the Feejee language *bakolo* or "long pig." As an English gentleman may send a choice haunch of venison as a present to another, so one Feejee chief will send a stalwart subject roasted entire like an ox, carefully trussed, and escorted by a procession to the residence of an ally. The epicures of Feejee prefer the flesh of women to that of men, and deem the thick of the arm and the thigh the tit-bits of the *bakolo*. The women are seldom allowed to taste it. The flesh of white men is held in low repute; it is said to be comparatively insipid or tainted with tobacco. A Feejeean is always armed, and war is the normal condition. The mountain fastnesses are well fortified with strong palisades and stone breastworks, pierced with loopholes. The arms chiefly used are clubs, spears, battle axes, the bow, the sling, and the musket. A peculiar weapon is the missile club, which is worn in the girdle, sometimes in pairs. It is a short stick, with a knob at one end, is hurled with great precision, and is a favorite weapon with assassins. The sick and aged request their sons to strangle them, or, if they are too slow to make this request, their sons suggest to them that they have lived long enough. To be strangled or buried alive by one's children is considered a most honorable death. They expect to be in the next world exactly as they were here, and affectionate children are unwilling to have their parents pass into the next world in an infirm state, and therefore strangle or bury them alive out of kindness. The relatives hold a wake over the intended victim while living and anointed for the sepulchre, and go into mourning after the entombment. The signs of mourning are the cropping of the hair and the joints of the small toe or little finger. Another remarkable custom is the *loloku* or strangling of the wives and next friends of the deceased. Abortion is practised to a great extent by medicated waters or mechanical means. Boys are circumcised when from seven to twelve years old. The native religions are local; each island has its own gods, traditions, and superstitions. All the systems belong to the lowest types of polytheism, and all are impregnated with the filth and savageness which characterize the actual existence of the people. The mythologies have some features in common; they retain the distinction between *dii minores* and *dii majores*, between gods and demigods. The latter class is made up chiefly of deceased chiefs and re-

spected ancestors. Monsters and other objects of wonder are admissible to this class. Most of the gods are supposed to have jurisdiction only over the tribes, islands, or districts where they are worshipped. Each trade has its tutelary deities. The Feejeeans have no idols, but reverence certain stones as shrines of the god, and hold certain birds and fishes as sacred. Every Feejeean considers himself under the protection of some special god, and refrains from eating the animal which is his symbol. Each chief has his *ambati*, or priest, who acts in concert with him, and helps him govern his clansmen. The priests are known by an oval frontlet of scarlet feathers, and a long-toothed comb made of several pieces of wood fastened together with much ingenuity. There are priestesses, but few of sufficient importance to have a temple. The priests are consulted as oracles; the responses are given after convulsions, supposed to be caused by the presence of the god. There are various modes of divination, all of the most childish character, such as by biting a leaf or pouring water down the arm. They have a strong belief in all sorts of apparitions, witches, ghosts, wizards, and the evil eye. They believe in a sort of fairies who dance on the hills by moonlight and sing songs. The future world in their opinion is much the same as the present. But concerning the doctrines of the Feejeean religion it is scarcely possible to learn anything. The people know nothing, and the priests dislike to communicate their knowledge. Burotu is the name of their place of departed spirits, and is said to be a most delightful abode; but the Feejeeans believe that, except for great chiefs, it is very difficult to pass into it. The only way by which an inferior man can hope to gain admission is by telling a lie to the god, and proclaiming himself a chief with so much apparent truthfulness that he is allowed to enter. In a large number of the islands, a particular town in Vanua Levu is thought to be the entrance to the spirit world. The houses in this town are built with their doors opposite to each other, so that the shade may pass through without interruption. The inhabitants speak in low tones, and if at a little distance communicate their thoughts by signs. Sneezing is ominous, and varies in its luck, according as it proceeds from the right or left nostril. The temples, *bure*, or fully *bure kaloo* (anything wonderful, whether good or bad, is denoted by *kaloo*), are built on a mound of earth, and found in every village, and some of the villages have many of them. No labor is thought too great for the decoration of a *bure*. Their marvellous skill in plaiting sinnet is best shown in such a building; every beam, post, and pillar is entirely covered with the most beautiful patterns, chiefly in black and red; even large cords are made of sinnet and hung in festoons from the eaves. But these *bures*, though considered temples, are mostly used for secular purposes. Visitors are generally quartered in

them, and the principal men of the village often make the bure their sleeping place. When a chief wishes to propitiate a deity he offers a great quantity of food in his temple, and inviting his friends consumes it in a general feast.—The Feejeean language belongs to the Oceanic or Malayo-Polynesian type. The letters may be easily represented with the English alphabet, omitting *h*, *x*, and *z*. It has the same nine parts of speech as the English. The articles are *ko* or *o*, *koi* or *oi*, *a* or *na*, and *ai* or *nai*. All adjectives are used as abstract nouns, as *vinaka*, good, and also goodness; but the verbs are the most fruitful source of nouns. All nouns used without *taganne*, a male, or *alewa*, a female, are of common gender; also nouns of relationship, as *luvena*, a son or daughter, *watina*, a husband or wife. The number of nouns is shown by prefixing numerals, or by the personal pronoun used in relation to them. There are some nouns to express certain things by tens, hundreds, and thousands only. Case is shown by particles preceding the nouns. *Vaka* is a particle much used; it changes nouns into adjectives, as *vuravura*, the world, *vakavuravura*, like the world; it changes adjectives into adverbs, as *vinaka*, good, *vakvinaka*, well; with nouns it expresses the possession of the thing, as *vale*, a house, *vakavale*, having a house; and it changes adjectives into verbs, and intransitive into transitive verbs. Some verbs have different terminations when affecting different objects, as *sokota na vanua*, to sail to land, *sokotaku na waga*, to sail the canoe. There are many reduplicated forms of verbs. Repetition of words is used to a great extent, and implies either frequency or intensity: *sa vosa vosa vosa*, talk, talk, talk, means always talking. Prepositions and conjunctions are few, but interjections are very numerous. Expletives, or ornamental particles, abound. Feejeean syntax is extremely simple. A proper accentuation is also very easily obtained. The accent is invariably on the last syllable, or last but one. A different quantity often alters the sense of a Feejeean word.—The Feejee group, which now contains, exclusive of coral islets, an area of about 5,500 square miles of dry land, is believed to have spread at the period when the corals began to grow over at least 15,000 square miles. Viti Levu and Vanua Levu are supposed to have formed a single island, which subsidence has separated by inundating the low intermediate area. The natives present a mixture of Papuan and Polynesian characters. Ethnology offers nothing of importance concerning them, for the Papuan race is one of the least known sections of mankind. The natives know nothing of former immigrations; they had no intercourse with other nations, except on casual visits, and they believe that they never occupied any country but the one where they now dwell. Even among the many independent states in the group there is little social and commercial communication, and no

political connection. Intestine quarrels and wars make up the history of the Feejees. The Dutch navigator Tasman saw the group on Feb. 6, 1643, and called it Prince William's islands, but effected no landing. On May 4, 1789, they were seen by Lieut. William Bligh, in his long and perilous boat voyage after being turned adrift from the Bounty, who gave them his own name. The first settlement by Europeans was made by a party of escaped convicts from New South Wales in 1804. The American exploring expedition under Lieut. Wilkes, 1838-'42, first excited the interest of civilized nations in the Feejee islands. The first British consul was appointed in 1858, and since then negotiations have been pending to put the group under the English government, on the suggestion of King Thakombau. But he was never king of Feejee, and he has long since lost the hold he formerly had upon the people and land. His reason for desiring to place the islands under British rule seems to have been merely to escape a claim on the part of an American citizen named Williams, whose house was accidentally burned, and who demanded an enormous sum for "destruction and spoliation of property." In 1869, 70 white residents petitioned the United States government to assume the dominion or protectorate of the islands. The white population having increased, a regular government was established in 1871, and a constitution adopted. This was subsequently abolished, and the government relapsed into barbarism. In 1874, partly owing to the wretched state of the finances, the sovereignty of Feejee was accepted by Great Britain.—In 1835 two Wesleyan missionaries made the first attempt to introduce Christianity in Feejee; missionaries of other sects followed; and after the usual history of massacres and persecutions, the churches report a most wonderful success. There are said to be more than 900 chapels and preaching places, 1,500 day schools, a theological institute, and more than 100,000 attendants on public worship.—See Wilkes's "United States Exploring Expedition around the World" (New York, 1856); Williams and Calvert's "Fiji and the Fijians" (London, 1858; revised ed., 1870); Mrs. Smythe's "Ten Months in the Fiji Islands" (London, 1864); the Rev. J. E. Wood's "Uncivilized Races of the World" (Hartford, 1870); and David Hazlewood's "Fijian and English Dictionary," containing brief hints on native customs, &c. (London, 1872).

FEHMARN. See FEMERN.

FEHNGERICHT. See VEHMIC COURTS.

FEITH, Rhljavis, a Dutch poet, born at Zwolle, Feb. 7, 1753, died there, Feb. 8, 1824. He completed his studies at Leyden in 1770, when he returned to his native town, where he spent the rest of his life in literary pursuits, holding at the same time an office in connection with the admiralty and that of burgo-master. His best lyrical productions are his *Oden en gedichten* (4 vols., Amsterdam, 1796—

1810). One of his finest tragedies is *Ines de Castro* (1793), and his most finished prose writings are *Brieven over verscheiden onderwerpen* (6 vols., 1784-'94). A complete edition of his works was published soon after his death (11 vols., Rotterdam, 1824).

FELANITX, or *Felaniche*, a town of Spain, on the island of Majorca, 25 m. E. S. E. of Palma; pop. about 8,000. It is in a fertile valley surrounded by mountains, and contains spacious streets and six squares. There is an ancient Moorish castle, with a subterranean vault, on the adjoining mountain of San Salvador de Felanix. An active trade is carried on in cattle, wine, fruit, and colonial produce. Linen and woollen goods and other articles are manufactured. The place is of great antiquity. The neighboring mountains abound with Moorish remains.

FELDKIRCH, a town of Austria, in Vorarlberg, on the Ill, and on the railway leading from the Tyrol into Switzerland, 20 m. S. S. W. of Bregenz; pop. 3,000. It is the seat of a vicar general who has jurisdiction over all the churches of Vorarlberg, and of a Jesuit college which has a large number of pupils from Austria, Germany, and other countries. It has cotton mills, machine and fire engine factories, a bell foundery, tile works, manufactories of articles of wood, distilleries of *Kirschwasser*, and an extensive trade.

FELDSPAR (Ger. *Feldspath*, from *Feld*, field, and *Spath*, spar), a species of aluminous minerals very abundantly distributed, principally in plutonic and volcanic rocks, as granite, gneiss, greenstone, and trachyte. The different species were formerly confounded, but they are now distinctly classified, not only by the different crystalline forms which they present, but, when these are the same, by distinct chemical composition. The feldspars are in all cases anhydrous double silicates, consisting of a silicate of alumina combined with a silicate of some one or more of the protoxides of potash, soda, lithia, baryta, or lime. The proportion between the aluminous or sesquioxide base and the protoxide bases is constant, being one equivalent of each, making the oxygen ratio 1 to 8; but the proportion of silica varies, causing considerable variation in the density and hardness. The amount of silica corresponds much to that in the rock in which the feldspar is found, and to the minerals associated with it, the more highly silicated kinds occurring in granite, and the less silicated in basalts. When a granite has large crystals of feldspar disseminated through it, it is called porphyritic granite, and sometimes porphyry, particularly when the proportion of feldspar is large. The various species of feldspar are given in the following table, as classified by Prof. Dana, with their systems of crystallization, and also their composition as indicated by the oxygen ratios of constituents; the first column of figures showing the protoxide, and the second the aluminous base, while the last col-

umn gives the proportion of silica according to the same ratio:

NAME OF FELDSPAR.	System of Crystallization.	Proportion of Constituents.
Anorthite, lime feldspar.....	Triclinic....	1 : 8 : 4
Labradorite, lime-soda feldspar....	"	1 : 8 : 6
Hyalophane, baryta-soda "	Monoclinic.	1 : 8 : 8
Andesite, soda-lime "	Triclinic....	1 : 8 : 8
Oligoclase, " "	"	1 : 8 : 9
Albite, soda feldspar.....	"	1 : 8 : 12
Orthoclase, potash feldspar.....	Monoclinic.	1 : 8 : 12

All the feldspars may be fused before the blow-pipe, with more or less difficulty, to a vitreous enamel, and this property causes them to be extensively used for glazing porcelain. The crystals of the several varieties range in hardness from 6 to 7 upon a scale of 10, being harder than glass, but less so than quartz. Their specific gravity varies from 2.5 in orthoclase to 2.7 in labradorite. The crystals of some species exhibit a beautiful play of colors; labradorite, the lime-soda feldspar, first discovered by the Moravian missionaries on the shores of St. Paul's isle off the coast of Labrador, being the most beautiful. The splendid opalescent and chatoyant reflections of this mineral have made it much prized as an article of jewelry. The cause of the play of colors has been satisfactorily explained by Reusch, who finds a cleavage structure of extreme delicacy transverse to the median section. He therefore regards the color as that of thin plates, produced by the interference of the rays of light. The more common feldspars are orthoclase, or common potash feldspar, and albite, or soda feldspar. The potash species is the one most frequently met with, and is the usual associate of mica and quartz in ordinary granite, and of hornblende and quartz in syenitic granite. Fine crystals of orthoclase are found at Carlsbad and Elnbogen in Bohemia; at St. Agnes in Cornwall; in the Mourne mountains in Ireland, associated with beryl and topaz; in great abundance in trachyte at Drachenfels, on the Rhine; and also in the lavas of Vesuvius, in the valley called Fossa Grande. In the United States, it is found at Mt. Desert on the coast of Maine, of a fine green; in Massachusetts, at South Royalton and Barre, in large crystals; in Connecticut, in the gneiss quarries at Haddam, and the feldspar quarries at Middletown, in crystals a foot long and from 6 to 8 in. thick; in New York, at Potsdam, St. Lawrence co., in crystals a foot thick, at Warwick, Orange co., associated with tourmaline and zircon, and in many other places. The formula of orthoclase is $K_2O, Al_2O_3, 6SiO_2$. The old formula, regarding silica as SiO , and using the small atomic weight of oxygen, is $KOSiO_3, Al_2O_3, 3SiO_2$. Albite, or cleavelandite, the soda feldspar, often replaces orthoclase as a constituent of granite, and in some instances is associated with it, as in Pompey's pillar, when it generally has a whiter color. Veins of albite

granite often contain the rarer granite minerals, such as beryl and tourmaline. In its compact state as felsite, it is the base of albite porphyry. It is found in Maine, at Paris, with red and blue tourmalines; in Massachusetts, at Chesterfield; in Connecticut, at Haddam, with beryl, columbite, and black tourmaline, and in other localities; in New York, at Granville, Washington co., in white transparent crystals; in Pennsylvania, at Unionville, Delaware co., where a granular variety is a matrix for corundum; and in Calaveras co., California, with native gold and auriferous pyrites. Albite has the same composition as that of orthoclase or potash feldspar, substituting soda in place of potash. Soda feldspars yield more rapidly than potash feldspars to the decomposing action of water and carbonic acid; and accordingly Prof. T. Sterry Hunt finds in the more recent crystalline rocks of Canada a less development of soda feldspar than of any other kinds, and conceives the carbonate of sodium resulting from the decomposition of the albite and similar minerals of the older rocks to have reacted with the chloride of calcium of the palæozoic ocean, producing deposits of carbonate of calcium and the chloride of sodium which is held in solution. In general, the decomposition of the feldspathic rocks has furnished the principal mass of the various clays, those containing the largest proportion of feldspar affording the finest deposits, such as kaolin, of which porcelain is made. The soil derived from them, particularly the common potash species, is noted for its fertility when under good cultivation, on account of their furnishing a large supply of potash, an important constituent of plants. The application of caustic lime to such soils, when they are worn, has the effect of liberating a portion of the potash, with the formation of silicate of lime; this accounts for the great difference often noticed in the fertilizing effects of the application of lime, depending upon the mineral character of the soil and upon the condition of the lime.

FÉLEGYHÁZA, or *Felgyháza*, a town of Hungary, in the district of Little Oumania, 65 m. S. E. of Pesth; pop. in 1870, 21,313. It is situated in an exceedingly fertile region, and contains a large Roman Catholic parish church, a gymnasium, and a fine town hall. The principal products of the vicinity are grain, fruit, tobacco, and wine, which is made in great quantities. There are four annual cattle fairs, which are much frequented.

FELICE, *Fortunato Bartolommeo*, an Italian author, born in Rome about 1725, died at Yverdun, Switzerland, Feb. 7, 1789. He studied under the direction of the Jesuits, and became a teacher of various sciences in Rome and in Naples. His abduction of a nun from a convent in the latter city obliged him to seek refuge elsewhere, and about 1756 he settled at Bern, where he became a Protestant. At a later period he founded a printing establishment and a boarding school at Yverdun. He translated into

Italian the works of Descartes, D'Alembert, and Newton, and edited with Tschärner (1758-'67) *L'estato della letteratura* and other periodicals. He edited Burlamaqui's *Principe du droit naturel et des gens*, and published an abridgment of the same under the title of *Leçons du droit de la nature et des gens* (4 vols., Yverdun, 1769), and many other works. His most extensive production is the *Encyclopédie, ou Dictionnaire universel des connaissances humaines* (48 vols. 4to, and 10 vols. of illustrations, 1770-'80). It was based on Diderot's cyclopædia, and he was assisted by Euler, Haller, and other eminent scholars. From this he compiled a *Dictionnaire de la justice naturelle et civile* (13 vols., 1778).

FÉLIX, called **FELIX OF VALOIS**, a saint of the Roman Catholic church, and founder (with John of Matha) of the order of Trinitarians, born in the district of Valois, France, April 19, 1127, died in the monastery of Cerfroi, Nov. 4, 1212. He was a man of considerable wealth, which he renounced to become a hermit in the forest of Galeresse, diocese of Meaux, where he dwelt until his 60th year. About that time John of Matha became his disciple, and inspired him with the idea of devoting his remaining years to the labor of redeeming the Christians held in bondage by the Mohammedans. For this purpose they both went to Rome in 1197 and submitted their design to Pope Innocent III. He approved it, and in furtherance of it a new religious order was established, styled the "order of the Trinity," or "for the redemption of captives," John of Matha being appointed its "minister general." Returning to France, they established a monastery in Cerfroi, which became the cradle of the order of Trinitarians. While John of Matha journeyed to Italy and Africa, Felix governed and propagated the new order. He obtained for it an establishment in Paris, near a chapel dedicated to St. Mathurin, and from this circumstance his monks were there called *les Mathurins*. The order established by him is called indiscriminately Trinitarians or Redemptionists.—See for his biography Baillet, *Vies des saints*, under date of Nov. 20, and Richard and Giraud, *Bibliothèque sacrée*.

FÉLIX, *Célestin Joseph*, a French preacher, born at Neuville-sur-l'Escaut, near Valenciennes, June 28, 1810. He studied at Cambrai, and after his ordination was employed there in pastoral duties. He entered the novitiate of the Jesuits in 1837, and was appointed professor of rhetoric in the college of Brugeslette. While there a discourse delivered by him at an academic celebration caused his superiors to employ him exclusively in the ministry of preaching. He went to Paris, heard the best speakers of the bar, the pulpit, and the legislature, preached his first course of Advent sermons in the church of St. Thomas d'Aquin in 1851, and the Lenten course in St. Germain des Prés in 1852. In 1853 he succeeded Lacordaire and Ravignan in the pulpit

of Notre Dame; and from that year until 1869 he held that post. He was superior of his order in Nancy, when in June, 1871, he was appointed superior of the Jesuit residence in the rue de Sèvres, Paris, in place of Père Ollivaint, killed during the commune. His sermons have been published under the title of *Le progrès par le Christianisme: Conférences de Notre-Dame* (13 vols. 8vo, Paris, 1856-'69).

FELLAHS (Arab. *fallah*, a cultivator), a term applied without distinction to all the peasantry in Syria, Arabia, and Egypt. Of the various races which exist in Egypt the Fellahs are the most ancient, and are probably mainly the descendants of the old Egyptians. They still present a physiognomy resembling that which is found upon ancient Egyptian sculptures. A patient and laborious population, they have held for ages the soil which

Fellahs.

the Nile fertilizes. They are generally of large stature, with broad chests, muscular limbs, and black and piercing eyes. The conformation of the brain indicates an intelligent race, the facial angle being usually almost a right angle, though within the Delta the Arab type of countenance predominates. The antique Egyptian type reappears most strikingly in the women, who, though slender and graceful, are remarkably strong. The dress of the Fellahs indicates misery and privation, being rarely more than a shirt, leaving bare the arms, legs, and breast. Their ordinary nourishment is coarse bread, water, and onions, to which they are sometimes able to add cheese, dates, beans, or rice. They live in huts about four feet high, the only furniture of which is a mat on which to sleep, a water jug, and a few kitchen utensils. They remain attached to the rudest

agricultural methods, and use almost the same implements as their remote ancestors; yet the fruitfulness of the soil compensates for their lack of skill. Mehemet Ali failed in his efforts to introduce among them the implements of modern invention. They are able to endure the greatest fatigue, and to work through the whole day in a burning climate with very little food, accompanying their labors with songs. The women share the heaviest labors of the men.—The Fellahs in Palestine are addicted to theft and robbery, and are averse to work unless compelled by necessity. This arises partly from their natural indolence, and partly from the exactions of an arbitrary government, which views with distrust any acquisition of wealth. They are generally in debt to usurers, who lend them money at a ruinous rate of interest.

FELLATAHS. See FOOLAHs.

FELLENBERG, Philipp Emanuel von, a Swiss educator and philanthropist, founder of the institutions at Hofwyl, born in Bern, June 27, 1771, died there, Nov. 21, 1844. His father was a member of the government and a friend of Pestalozzi. His mother was a descendant of the Dutch admiral Van Tromp. He studied at Colmar and Tübingen, and travelled extensively with a view of familiarizing himself with the condition of the working and suffering classes. He was at Paris shortly after the fall of Robespierre, and there his early convictions became strengthened that improved systems of education alone can protect society against revolutions. Returning to Switzerland after taking part against the French, he was exiled when they had succeeded in taking Bern, and went to Germany, where he resided some time. After his return to Switzerland he was employed by the government in a mission to Paris, and in high military and political functions at home. Finding that nothing would be done by the government for the accomplishment of his favorite educational projects, he resolved to devote his large fortune to the purchase of the estate of Hofwyl near Bern, and to the establishment of model institutions in accordance with the views of Pestalozzi. Fellenberg's aim was to elevate all classes by opening an institution alike to the poor and the rich, and by not only making agriculture the basis of his instruction, but also elevating that profession to the dignity of a science. Apart from the agricultural school, he founded an establishment for the manufacture of improved agricultural implements. At the same time he laid the foundation of a scientific institution, for which the first building was erected in 1807. The agricultural institution was opened in 1808, and he established in the same year a normal school, which became popular among the teachers of Switzerland, and grew in importance as its advantages became known abroad. The institution was gradually enlarged, and comprised altogether seven distinct schools, to which a primary school was added in 1830,

and still another school for children at a subsequent period. By these schools, and by his writings on the subject of agriculture and education, Fellenberg exerted a remarkable influence in Europe; and although the institutions which he founded were dissolved after his death, after having been conducted for several years by one of his sons, kindred institutions have sprung up in Switzerland and Germany, and the celebrated pauper colony of the Netherlands at Frederiksoord, province of Drenthe, was founded in 1818 by a pupil of Hofwyl. Fellenberg was assisted in his benevolent labors by his wife, and by the greater number of their nine children.—See Hamm, *Fellenberg's Leben und Wirken* (Bern, 1845). Robert Dale Owen was a pupil at Hofwyl, and in his autobiography ("Threading his Way," 1874) has given an interesting account of the school.

FELLER, François Xavier de, a Belgian author, born in Brussels, Aug. 18, 1785, died in Ratisbon, May 21, 1802. He was educated in the Jesuits' colleges at Luxemburg and Rheims, and after becoming a member of their order was employed as professor at Luxemburg and Liège. He went afterward to Tyrnau in Hungary, and after passing some time there, he travelled extensively in Hungary, Austria, Bohemia, Poland, and Italy. He was preacher in the college of Liège when the order of Jesuits was suppressed in Belgium in 1778, and afterward devoted himself to literature. Being compelled to leave Belgium at the occupation of that country by France in 1794, he spent two years at Paderborn, and subsequently retired to Ratisbon. Among his works are *Observations philosophiques sur le système de Newton* (3d and enlarged ed., Liège, 1778), and *Catéchisme philosophique* (4th ed., 1805; new ed., from the author's annotations, Lyons, 1819). He left many other writings, chiefly on religious subjects; but his principal work is his *Biographie universelle, ou Dictionnaire historique*, &c., which passed through many editions, and after his death was revised and continued under the direction of M. Charles Weiss and the abbé Busson, and brought down to 1848 (9 vols. 8vo, Paris, 1847-'56).

FELLOWES, Robert, an English author, born in Norfolk in 1770, died in 1847. He graduated at St. Mary's hall, Oxford, and in 1795 took holy orders, but subsequently rejected the doctrines of the established church, and adopted the opinions which are given at length in his "Religion of the Universe," published in London in 1836. He had previously published "A Picture of Christian Philosophy" (8vo, London, 1800); "Religion without Cant" (1801); "The Guide to Immortality" (8 vols., 1804); "A Manual of Piety, adapted to the Wants and calculated for the Improvement of all Sects of Christians" (1807); "A Body of Theology, principally practical, in a Series of Lectures" (2 vols., 1807), &c. Mr. Fellowes was an intimate friend of Dr. Parr and Baron

Masères, the latter of whom left him the greater part of his large fortune, to be dispensed in literary and benevolent enterprises. He was one of the earliest advocates of the establishment of the university of London, of which he was a frequent and liberal benefactor.

FELLOWS, Sir Charles, an English traveller and archæologist, born in Nottingham in 1799, died Nov. 8, 1860. He published a "Journal written during an Excursion in Asia Minor" (8vo, London, 1839), in which he gave descriptions of the superb architectural and sculptural remains of the cities of Xanthus and Tlos. The interest excited by the work induced the government to apply to the Porte for a firman, authorizing the removal of specimens of the ancient works of art described by Mr. Fellows, who departed on a second tour through Lycia, in the course of which he discovered 13 other ruined cities. Having learned that the Porte declined to grant the firman, he returned to England, and published "An Account of Discoveries in Lycia, being a Journal kept during a Second Excursion in Asia Minor" (8vo, 1841). The government were at last successful in procuring the desired firman, and a new expedition succeeded in transporting to England a number of cases of sculptures, which are now deposited in the "Lycian Saloon" of the British museum. Another expedition, also under the direction of Mr. Fellows, brought a number of additional marbles to England in 1844. For these services he received in 1845 the honor of knighthood. His remaining publications are: "Account of the Xanthian Marbles in the British Museum" (1843), a pamphlet written to correct some misstatements; "Account of the Trophy Monument at Xanthus" (1848); and "Coins of Ancient Lycia" (1855).

FELO DE SE, one who commits felony against or upon himself. As felony is, in common-law language, any capital offence, and murder is the only capital offence which a man can commit against himself, a *felo de se* is a self-murderer, or one who kills himself with malice aforethought. Indeed, the legal definition of a felony *de se* (or suicide) is said to include the doing of any unlawful and malicious act, although aimed primarily against another, whereby death ensues to the guilty person. In England this crime was punished not only with forfeiture of goods and chattels, like other felonies, but, to mark the detestation of the law, and to deter others from a similar crime, the body was treated ignominiously, and buried in the open highway with a stake thrust through it. This very ancient rule fell into general if not entire disuse in England many years ago, but it was not repealed until the statute 4 George IV., c. 51; and even then, to manifest the horror of the law at the act of suicide, it was ordered that the body (which might be placed in a churchyard or other consecrated ground) should be buried at night, and without the performance of religious rites. (See

Blackstone's Commentaries, vol. iv., p. 190.) Suicide does not seem ever to have been made punishable as a crime by any statutory provisions of the United States; nor are we aware that the barbarous usages of England in relation to the burial of the corpse were ever practised here. It is held at the common law that if one encourage and assist another in the commission of suicide, he is guilty of murder as a principal.

FELONY. The origin and the exact meaning of this common-law term are both uncertain. There is about equally good authority for deriving it from the Saxon words *feh*, fee, and *lon*, price or pay, when its primary sense would be forfeiture or loss of fee; or from a single word *felen*, to fall or fail, when its meaning might be the falling of the guilty party into crime, or the falling of his land into the hands of his lord by forfeiture. It seems quite certain that in England, from the earliest times, felony was always attended by absolute forfeiture of land or of goods, or of both; and the definition of Blackstone (4 Bl. Com. 95) is, in accordance with this principle: "An offence which occasions a total forfeiture of lands or goods, or both, at the common law, and to which capital or other punishment may be superadded, according to the degree of guilt." But we understand Blackstone to mean, generally, by felony, all capital crimes below treason (p. 98); and Coke says (8 Inst. 15) that treason itself was anciently included within the meaning of felony. In those distant ages a felon was to be punished: 1, by loss of life; 2, by loss of land; 3, by loss of goods; 4, by loss of blood, or attainder, under which he could have no heir, and none could ever claim through him. In more recent times felony meant in practice any crime punishable with death; and therefore when a statute declared any offence to be felony, it became at once punishable with death; and *vice versa*, a crime which is made punishable with death becomes thereby a felony. Even in early times felony was sometimes defined as any capital crime; although it is said that before the reign of Henry I. felonies were punished only by pecuniary mulct or fine, and that sovereign having about 1108 ordered those guilty of felony to be hanged, this has since been the law of England. (Tomlin's "Law Dictionary," word "Felony.") It cannot be doubted, however, that at common law the forfeiture incurred by the crime was the essence and the test of felony. In the United States there is little or no forfeiture for crime (see **FORFEITURE**); and in England capital offences are far less numerous than formerly. It may be said that in the United States the word, so far as it has any definite meaning, signifies a crime punishable with death or imprisonment. The statutes of some of the states define it as any offence punishable to a certain extent, as by death or confinement in the state prison or penitentiary.

FELSING, Jakob, a German engraver, born in Darmstadt in 1802. He received his first instruction from his father, studied at the academy of Milan, and acquired reputation by his faithful reproduction of the manner of the painters whose works he engraved. After residing in Italy, and visiting Munich and Paris, he returned to Darmstadt in 1839. His best engravings are from Carlo Dolce's "Christ on the Mount of Olives," Andrea del Sarto's "Madonna on the Throne," Raphael's "Violin Player," Bendemann's "Young Girl at the Fountain," Overbeck's "Holy Family," Crespi's "Christ with the Cross," Correggio's "Marriage of St. Catharine," and Steinbrück's "St. Geneviève," and other paintings of the Düsseldorf school.

FELT, a fabric of wool or fur, separate or mixed, manufactured by matting the fibres together without spinning or weaving. The fur of the beaver, hare, rabbit, and seal, camel's and goat's hair, and the wool of the sheep, are well adapted for this process. Felt is an ancient manufacture, supposed by Pliny to have been produced before woven cloth. It is probably the same as the *lana coacta* anciently used for the cloaks of soldiers, and by the Lacedæmonians for hats. Early in the present century a piece of ancient felt was discovered with some other stuffs in a tomb at St. Germain des Prés, and a paper relating to them was presented by Desmarest in 1806 to the academy of sciences.—The production of a fabric from the loose fibres results from the tendency these have from their barbed structure to work together when rubbed, each fibre moving forward in the direction of its larger end without a possibility of moving in the other direction. This peculiar structure of the animal fibre, so different from that of the smooth vegetable fibres, is readily perceived on drawing a filament of wool through the fingers, holding it first by one end and then by the other. Examined through a powerful microscope, the short fibre exhibits the appearance of a continuous vegetable growth with numerous sprouts, all pointing toward the smaller end. In a filament of merino wool as many as 2,400 of these projections or teeth have been found in a single inch; and in one of Saxon wool of superior felting quality there were 2,700 serrations in the same space. Southdown wool, which is not so much esteemed for this use, contained only 2,080 serrations in one inch; and Leicester wool, which is not at all adapted for felting, only 1,860. The short curly fibres of wool, freed from grease and brought together, intertwine at once very closely and form a compact mat. By rubbing this with the hands, and moistening it with some soapy liquid, the matter is made more dense according to the pressure with which it is rubbed. At last the fibres can go no further without danger of fracture, and the fabric becomes hard and stiff. It may, however, be made thicker to any desired extent by adding more fibres and rubbing these in by separate

layers. Drugget is a variety of felt in which machinery is made to agitate and work the fibres of wool together. A coarse variety of felt cloth has of late years been introduced, in the manufacture of which improvements have been made greatly facilitating the process.—The method of making felt will be more particularly noticed in the article HAT.

FELTHAM, or *Feltham*, Owen, an English author, died about 1680. No event of his life is known except that he resided for many years in the house of the earl of Thomond. He wrote "Resolves, Divine, Political, and Moral" (3d, and 1st complete ed., 1628; 10th ed., 1677), which has been highly admired for its exuberance of wit and fancy, fervent piety, and occasional subtlety of thought. Feltham is the author also of a few minor pieces in prose and verse.

FELTON, *Cornelius Conway*, an American scholar and writer, born at Newbury, Mass., Nov. 6, 1807, died at Chester, Pa., Feb. 26, 1862. He graduated at Harvard college in 1827. While in college he was distinguished for his literary tastes, and the wide range of his studies. He supported himself to some extent by teaching in Concord and Boston, and in the Round Hill school at Northampton, Mass. In his senior year he was one of the conductors of the "Harvard Register," a students' periodical. After leaving college he was engaged for two years, in conjunction with two of his classmates, in the charge of the Livingston high school in Geneseo, N. Y. He was appointed Latin tutor in Harvard college in 1829, Greek tutor in the following year, college professor of Greek in 1832, and Eliot professor of Greek literature in 1834. In addition to the duties of this professorship he filled for many years the office of regent of the college. In 1833 he published an edition of Homer, with English notes and Flaxman's illustrations, which has since passed through several editions, with revisions and emendations. In 1840 a translation by him of Menzel's work on "German Literature," in three volumes, was published among Ripley's "Specimens of Foreign Literature." In the same year appeared his "Greek Reader," containing selections in prose and verse from Greek authors, with English notes and a vocabulary; this has since been frequently reprinted. In 1841 he published an edition of the "Clouds" of Aristophanes, with an introduction and notes; since revised and republished in England. In 1843 he aided Professors Sears and Edwards in the preparation of a work on classical studies, containing essays on classical subjects, mostly translated from the German. He assisted Longfellow in the preparation of the "Poets and Poetry of Europe," which appeared in 1845. In 1847 editions of the *Panegyricus* of Isocrates and of the "Agamemnon" of Æschylus, with introductions and English notes, were published by him; a second edition of the former appeared in 1854, and of the latter in

1859. In 1849 he translated from the French the work of Prof. Guyot on physical geography, called "The Earth and Man;" and in the same year he published an edition of the "Birds" of Aristophanes, with an introduction and English notes, which was republished in England. In 1852 he edited a selection from the writings of Prof. Popkin, his predecessor in the Eliot professorship, with an introductory biographical notice. In the same year he published a volume of selections from the Greek historians, arranged in the order of events. The period from April, 1853, to May, 1854, was spent by him in a European tour, in the course of which he visited Great Britain, France, Germany, Switzerland, Italy, and Greece; giving about five months to the last named country, visiting its most interesting localities, and carefully studying its architectural remains. In 1855 he revised for publication in the United States Smith's "History of Greece," adding a preface, notes, and a continuation from the Roman conquest to the present time. In the same year an edition of Lord Carlisle's "Diary in Turkish and Greek Waters" was prepared by him for the American press, with notes, illustrations, and a preface. In 1856 he published a selection from modern Greek writers in prose and verse. Besides the above, he compiled an elementary work on Greek and Roman metres, and wrote a life of Gen. Eaton for Sparks's "American Biography," and also various occasional addresses, and numerous contributions to the "North American Review," "Christian Examiner," and other periodical publications. He delivered four courses of lectures before the Lowell institute in Boston, on subjects connected with the history and literature of Greece. He wrote the articles on Agassiz, Athens, Attica, Demosthenes, Euripides, Greece, and Homer for the first edition of this Cyclopædia. He was a member of the Massachusetts board of education, and one of the regents of the Smithsonian institution. In the summer of 1858 he made a second visit to Europe, partly on account of impaired health, and partly to complete some investigations into the language, topography, education, &c., of Greece. An account of this visit was given in his "Familiar Letters from Europe," published after his death (Boston, 1864). In 1860, on the resignation of President Walker, he was elected president of Harvard college. His most important work, "Greece, Ancient and Modern," was published posthumously in 1867 (2 vols. 8vo); it was made up chiefly from his lectures before the Lowell institute.

FELTRE, a town of Italy, in the province and 18 m. S. W. of the city of Belluno, on the border of Tyrol, at the confluence of two small affluents of the Piave, at the foot of the last slopes of the Rætian Alps; pop. about 5,500. Remains of the mediæval fortifications are still visible in the upper town. The cathedral contains fine pictures. The *monte di pietà*, found-

ed in the 15th century by Father Bernardini, is regarded as the oldest establishment of the kind in Europe. Wax bleaching and silk weaving are the principal branches of industry, and there is a brisk trade in wine, silk, and oil. The former see of Feltre has been united with that of Belluno, but the town is still the seat of a vicar apostolic. Marshal Clarke, one of Napoleon's generals, derived his ducal title from this place.

FEMERN, *Fehmern*, or *Fehmarn*, an island of Prussia, in the province of Schleswig-Holstein, separated from Holstein by the Fehmarn sound, and from the Danish island of Laaland by the Fehmarn belt, 87 m. E. N. E. of Kiel; area, about 70 sq. m.; pop. about 10,000. It is accessible only to small boats, owing to the shallowness of the sea. The principal products are grain and peas. There is an active trade in woollen hosiery, and a number of the inhabitants are also engaged in fishing. Capital, Burg or Borg.—Femern was taken in 1420 by King Eric of Denmark, who had all the young women slain on the so-called Maiden mountain, near the village of Petersdorf. It was recovered by the duke of Holstein in 1426. The treaty of Flensburg, 1580, gave the island to the Gottorp line of dukes, with whom it passed to Denmark two centuries afterward. Femern was taken by Prussia in March, 1864, during the war with Denmark.

FENCING, the art of attack and defence with any weapon but such as cut or break by sheer force. The word is, however, understood to allude especially to the management of the small sword or rapier, and when any other arm, such as broadsword, bayonet, or stick, is used, the kind of weapon is specified. Fencing was cultivated by the ancients, as shown by the Roman gladiators. During the period when suits of armor were worn by combatants, battle axes and other ponderous weapons were much adopted, and fencing fell into disuse. When, however, metal casing was abandoned, it came again into vogue. The peculiar state of society existing in Italy in the 16th century made such knowledge more needed there than elsewhere; consequently the Italians became the most expert fencers of that epoch, and were the teachers of the art to other nations. The next country which found the art to be a necessity was Spain, whither it was imported from Italy. There the art was improved, and the amendments were accepted by the Italians. From Italy fencing was also imported into France, where the court and gentry favored it so much that it quickly took a fresh development, and a new school was established.—Though the principal object in studying the art of fencing is to enable men to wield arms with advantage, it is also pursued by many as a recreation and an exercise. While it demands no violent straining of the muscles, it develops in an extraordinary degree the whole *physique*, and imparts the most perfect delicacy of touch, with steadiness and lightness of hand.—The

fundamental principle upon which is based the defence of the person by means of the small sword is a peculiar application of the power of the lever, whereby the fencer who parries an attack causes the point of his adversary's blade to deviate from the direct course, and throws it aside from his body through pressing or striking the *faible* (part near the point) of his adversary's weapon by the *forte* (part near the handle) of his own. The surface of the front of the body is, in fencing language, divided by an imaginary line, horizontal, and just below the breast, separating the upper from the lower portion; the upper part is again subdivided by a perpendicular line, the right of which is termed the outside, the left the inside. There were in the old school eight parries, distinguished by the Italian numerals *primo*, *secondo*, *terzo*, *quarto*, &c., from which are taken the modern terms *prime*, *seconde*, *tierce*, *carte*, &c. The instrument adopted for exercise is called a foil; it has a handle similar to the small sword, which it is intended to represent; it has a guard of metal or leather between the handle and the blade, which blade is of pliant steel, having at the end a button in place of a point. The parries are made with the weapon itself; the upper part of the body to the right is defended by the parry termed *tierce*, the upper part to the left by that termed *carte*, and the lower line by *seconde*. Of the old parries these are the chief; indeed the others are nearly obsolete, or used only in certain exceptional cases. When the fencer is left-handed, the left of his person instead of the right is most exposed to his adversary, and the parries of *carte* and *tierce* are reversed. The fencer is expected to depend upon his sword hand for protection, rather than upon his agility of leg; nevertheless he must be quick and active on his legs to be able to advance, retreat, or lunge. Thrusts are directed solely at the body; a hit upon a limb can only be accidental, and in a fencing school will not be counted as a hit. An attack or a *riposte* may be made by the mere extension of the arm, or accompanied by a lunge, that is, by advancing the body, stepping forward with the right foot without moving the left one. An engagement means the crossing of the blades. A *riposte* means the attack without pause by the fencer who has parried.—The early Italian and Spanish schools taught the management of the sword aided generally by the dagger or the mantlet; the shifting of the position of the fencer to the right or left was also called into requisition in avoiding an attack. But since the habit of wearing the dagger and mantlet has been abandoned, and the velocity of attack and riposte has become so great that the dagger and mantlet would be an encumbrance, and the shifting of the position would be fatal to him who relied upon it, the instruction in defence has been confined solely to the foil. The Italian foil is long, some 38 to 40 in.; the ancient was longer than the more modern.

The Italian is also much heavier and less pliant than the French foil, which is only 34 in. in length. The handle has just beneath the guard a ring in which the fencer inserts his fore and middle fingers to grasp firmly the weapon, which is further secured to the hand by a bandage; whereas the French use neither the ring nor the bandage. The guard to protect the hand is of metal in the Italian foil, and very large; in the French foil it is much smaller and lighter. The pure Italian school is in vogue only in lower Italy and Sicily, and the Neapolitan masters are justly celebrated for their adroitness in this particular method. The characteristic of the Neapolitan school (which more than any other partakes of the old Italian and Spanish) is to extend the arm so as constantly to present the point direct to the adversary's breast; the hand is kept in the centre of the person at nearly the elevation of the shoulder; the large guard between the handle and the blade serves somewhat the purpose of a little shield by causing the attacking point to glance off the hand of the fencer on the defensive, slightly bearing to the left or right (*carte* or *tierce*), according as he finds himself menaced. The arm being already fully extended has the tendency to keep an adversary at a distance, and also facilitates the lunge of the attacker. The fencer can also defend himself by a circle parry, which the Neapolitan makes by describing with the point a small circle 8 to 12 in. in diameter, for the purpose of catching up an adversary's point which may glide away from the engagement under the blade, menacing the lower line, or the upper one if it complete the disengagement. The Venetian school, of those of upper Italy, resembles most the Neapolitan; the Piedmontese is mixed, partaking of the old French and the Neapolitan. The Spanish school is a modification of the Neapolitan, in which the attack is assisted by extraordinary gymnastics of the leg, the fencer at times throwing himself nearly on the ground and attacking much in the lower line. This, like every other peculiarity, when well executed, is very embarrassing to one not accustomed to it.—When the French established a method of their own, the deviation from the Italian model consisted in the fencer having a less extended sword arm, the hand (medium guard) at the height of the breast, the elbow slightly bent, and the point of the sword at about the height of the eye. The knees were a little more bent, but the body was kept back as if to get out of reach of attack. Among the additions to the defence may be especially noted the half circle (old style), having the hand about level with the shoulder and the point depressed to the height of the waist, protecting the lower line to the left (*carte*), and being consequently the opposite of *seconde*, which bore the adversary's blade to the right. A new mode of attack was also introduced, termed *coupé*, or the cutting over the point instead of disengaging under the blade. Here were also introduced the bat-

tement or sharp tap preceding an attack, the effect of which is to make the person thus attacked grasp his foil nervously and thus render his hand for the moment rigid and unsuited to parry with rapidity. The change of engagement has much the same effect. Some disarms were introduced, but they are practically useless except when the hit is given by the same blow, for an adversary who is seen to be disarmed cannot be touched. Lafaugère introduced the *couronnement*, which was made by raising the hand instantly after the parry (*carte* or *tierce*), and with the forte of one's own blade mastering the faible of the adversary's, then (as the latter in this situation tries to close the line of the riposte) turning or sliding the blade round it without quitting it, and delivering the riposte in the opposite line to that of the parry. The half-circle parry of Bertrand is made with the nails upward, the hand at the height and to the right of the forehead, the arm more than half extended, the point very slightly depressed and projecting leftward about as far as the line of the left shoulder, rather but not completely in the direction of the adversary. The blade in this parry catches up the attacking foil and exposes the entire body of the attacker to a riposte, which comes with incredible velocity, the point after the half-circle parry being very near to the breast of the opponent.—The instruction for the small sword is the basis of the attack and defence with every other weapon; nevertheless almost every attack and parry with the broadsword is the reverse of those with the small sword. Instead of having the point further out than the hand on the side of the guard, the blade is kept across the body; instead of the touch being the guide, the eye principally directs the movements; instead of piercing with the point, the hit consists of a cut with the blade. The cut can be given as a blow, or with a light hand, which makes it razor fashion. There are also circle parries called *moulinets*, whereby the man who parries swings round his sword, describing a complete circle with the point, and having his own wrist as the pivot for the movement. The use of the broadsword on horseback is but a variation of its application by a combatant on foot; the horseman is obliged to protect his horse as well as himself. Heavy cavalry are armed with long heavy swords, and hit heavily. The Turks have curved scymitars and adopt the razor cut; they also use swords weighted at the extremity, whereby they combine together the blow and the razor cut. The Germans have a long sword which they (students especially) manœuvre with an extended arm; it may be regarded as the Neapolitan school applied to the broadsword. The bayonet at the end of the musket is, when employed by a line of soldiers, a very formidable weapon; but on account of the leverage it offers it is of little use to an isolated man, unless to defend himself against a mounted dragoon. The motion of the bayonets in

line (the stock of the musket grasped by the right hand and the barrel steadied by the left) should be straight forward; any attempt to parry by leverage right or left would only cause a point to glance from one man into some other. The foot soldier isolated can parry head or body cuts and thrusts from sabre or lance, and can riposte by jerking forward or right or left the point, striking the horse if he miss the rider. Certain modern bayonets used for the rifle corps are very long, with a view to compensate in a measure for the shortness of the firearms at the end of which they are fixed. Such bayonets have besides their point an edge wherewith to cut. The lance is utterly worthless, except for cavalry, by whom it can be most efficiently employed in pursuing a routed foe; its use as a fencing weapon, therefore, requires little explanation. The knife or dagger requires quickness of hand and eye. The blow can be given by striking downward, straight forward, or upward; in the two latter cases the weapon is shifted from the ordinary grasp of the handle, so that the pomel rests in the palm of the hand and the stab is given with ease and force. The Spanish colonists employ their hats held in their left hands as shields, and also to mask the attack, concealing the knife behind the hat. The stick is a formidable weapon used to inflict blows, as with the broadsword; the ferrule end can as a point be most effectually driven into the face of an adversary. The quarterstaff is out of use; it was held in the middle and used not only in striking but in thrusting, when one end was suddenly driven forward like a bayonet.—In 1536 Marozzo of Venice published the first work on the subject. Other works are: Thibault, *Académie de l'épée* (Paris, 1628); Meyer, *Kunst des Fechtens* (1670); La Boissière *L'Art des armes* (Paris, 1815); Otto, *System der Fechtkunst* (Olmütz 1852); Linsingen, *Handbuch des Bajonnetfechtens* (Hanover, 1854); J. Hewitt, "Ancient Armors and Weapons in Europe" (Oxford, 1855); G. B. McClellan, "Manual of Bayonet Exercise" (Philadelphia, 1856); G. Patten, "Infantry Drill and Sabre Exercise" (New York, 1861).

FÉNELON, Bertrand de Salignac, marquis de la Mothe, a French diplomatist, died in 1589. After having served with distinction in the army, he was ambassador to England at the time of the massacre of St. Bartholomew, and was charged by Charles IX. to endeavor to appease the resentment of Elizabeth. The most important of his numerous writings are: *Mémoires touchant l'Angleterre et la Suisse, ou Sommaire de la négociation en 1571*; *Négociations de la Mothe Fénelon et de Michel, sieur de Mauvissière, en Angleterre*, containing some curious correspondence between Catharine de' Medici and her son Charles IX. relating to Queen Elizabeth, Mary queen of Scots, and the massacre of St. Bartholomew; and *Dépêches de M. de la Mothe Fénelon*. These were published in the *Mémoires* of Castelnau.

FÉNELON. I. François de Salignac de la Mothe, or Lamotte, a French prelate and author, born at the château of Fénelon, in Périgord, Aug. 6, 1651, died in Cambrai, Jan. 7, 1715. He was the son of Pons de Salignac, count de la Mothe Fénelon, and a nephew of the marquis de Fénelon, under whose care he received much of his education. At the age of 12 he was sent to the university of Cahors, and a few years later he removed to Paris in order to complete his course of philosophy in the college of Plessis. He next entered the theological seminary of St. Sulpice, under the direction of the abbé Tronson, and about 1675 received holy orders. He wished at first to devote himself to foreign missions, but this design was overruled; and after three years passed as a preacher and catechist at the church of St. Sulpice, he was appointed by the archbishop of Paris superior of the society of *Nouvelles Catholiques*, established for the instruction of female converts. Meanwhile he cultivated the friendship of the abbé Fleury and of Bossuet, bishop of Meaux, and was a frequent guest at the brilliant reunions which took place at the bishop's country seat. The distinguished society into which he was thus thrown, the charm of his manners, and his eloquence in the pulpit, soon drew him into public notice. To enable him to meet his expenses, one of his uncles, the bishop of Sarlat, gave him a small living at which he was not required to reside permanently. It yielded him 3,000 francs a year, much of which he spent upon the poor, and this until 1694 was his only income. His first public service was in the capacity of missionary to the Protestants in Saintonge and Poitou, after the revocation of the edict of Nantes. He was presented to Louis XIV. by Bossuet, and the only favor he asked of the king in accepting the office was that no violence should be used within the field of his mission. Aided by the abbés de Largeron and Fleury, but still more by his own mild and amiable character, he succeeded in winning over large numbers of the Protestants, and soon tranquillized a population whom persecution had roused to a dangerous excitement. After his return to Paris in 1689 Louis appointed him preceptor to his grandsons, the dukes of Burgundy, Anjou, and Berry. For their use Fénelon composed "Dialogues of the Dead," "Directions for the Conscience of a King," "Abridgment of the Lives of Ancient Philosophers," and the "Adventures of Telemachus." The success with which he discharged his important and delicate trust gained him for some time neither praise nor pecuniary reward. Louis, though not blind to his merit, was never his friend; but Mme. de Maintenon had long been one of his warmest admirers, and it was probably through her influence that he received in 1694 the rich abbacy of St. Valery. Toward the close of this year he drafted the famous anonymous letter to the king, setting forth the disorders and abuses of his reign, which was first published by D'Alembert, and whose au-

thenticity, after much dispute, was settled by the discovery of the original MS. in 1825. It is not probable that Louis suspected the author, for in the following February he nominated Fénelon to the archbishopric of Cambrai. The ceremony of consecration was performed in the chapel of St. Cyr, July 10, 1695, but the new prelate retained his connection with his pupils, with whom it was arranged that he should pass three months of every year. Honored by the king, beloved by the young princes, esteemed and consulted by the most influential person of the court, and holding high stations in the church and the palace, he was now at the height of his prosperity; but his disgrace was already preparing. With a natural tendency to all that is mild and spiritual in religion, he had long felt a sympathy for the doctrines of Mme. Guyon, whose system of "quietism" was attracting a large share of attention at court, and had gained proselytes in the king's household. She was charged with heresy, and demanded a commission to inquire into the matter. Bossuet, the bishop of Châlons, and Tronson were appointed. Besides the writings of Mme. Guyon, the commission was obliged to investigate what Fénelon was daily writing and preaching on the subject, perhaps with the intention of turning upon himself the condemnation that was threatening his friend. Fénelon was so humble in his intercourse with the commission, that his judges, though startled at his errors, would urge nothing against him. These conferences had lasted nearly a year, and it was necessary to put an end to them. Bossuet and his two colleagues agreed upon a series of articles which should settle the matter; and making a sort of formulary, they invited Fénelon to subscribe to it. He hesitated for a long time, but at last acceded to the demands of the prelates. During the interval of editing and signing the formulary, Fénelon was called to the archbishopric of Cambrai, and after his consecration occurred between him and Bossuet that celebrated controversy which forms almost an epoch in French literature. As Archbishop Fénelon assumed a more decided tone, Bossuet explained the articles of the formulary in an abridged report of the previous conferences, and asked Fénelon to give this book, entitled *Instructions sur les états d'oraison*, his ecclesiastical approbation, as the other two prelates of the commission had done. Fénelon refused; he would not even read the book; and from this refusal dates the literary war between these two great prelates. Fénelon published his famous book, *Maximes des saints*. Bossuet denounced him to the court as a fanatic; the king struck his name from the list of preceptors to the royal family, and ordered him to retire to his diocese; Mme. de Maintenon withdrew her favor, and his friendship for Mme. Guyon was even made a theme for the grossest calumnies. He sent the obnoxious book to Rome, where Louis used all his influence to obtain its condemnation. Af-

ter a delay of nine months Innocent XII. pronounced a mild censure of the *Maximes des saints*, but addressed at the same time to certain prelates who had been most severe in their attacks on the author the following caustic rebuke: *Peccavit excessu amoris divini, sed vos peccastis defectu amoris proximi* ("He has sinned through excess of love of God, but you have sinned through lack of love for your neighbor"). Immediately on receiving the sentence, in March, 1699, Fénelon hastened to declare his submission, and to publish the condemnation of his own book in a mandatory letter. In the following month his *Aventures de Télémaque*, which had hitherto remained in manuscript, was given to the world by the dishonesty of a servant who had been employed to have the work copied, but who sold it to a bookseller without disclosing the author's name. The king having been told that it was from the pen of the archbishop of Cambrai, and probably sharing a suspicion then current that the book was designed as a satire on the court, took measures to suppress it. A few copies escaped seizure, and an imperfect edition was printed in Holland in 1699, and others followed rapidly. This event destroyed all hope of restoration to royal favor, and for the rest of his life Fénelon devoted himself exclusively to the affairs of his diocese and to literary pursuits. It was now that his character was seen in its brightest light. He visited the peasants in their cottages, shared their humble fare, heard their complaints, relieved their wants, and made his palace an asylum for the unfortunate. His charities were enormous. When his diocese was traversed by hostile armies during the war of the Spanish succession, he was allowed to pass unhindered through the ranks of the enemy on his errands of benevolence. He founded the theological seminary of Cambrai, and devoted himself to the instruction of the clergy. When his pupil the duke of Burgundy became dauphin by the death of his father, he addressed to him a "Plan of Government," proposing the establishment of states general and provincial, with many reforms in public administration; and had the prince lived to reign, it is thought that Fénelon would have been his prime minister. The archbishop did not long survive his pupil. —Of the excellence of Fénelon's best work, the "Adventures of Telemachus," no better proof could be given than its general and lasting popularity. Hallam denies it the high character of an epic, but gives it the first place among classical romances. It has been translated into nearly all European languages, and has been turned into verse in English, Latin, Greek, &c. His controversial writings, which comprise works against the Jansenists and Gallicans, on quietism, &c., are distinguished by an unwonted preference of individual Christian experience to the testimony of the traditions of the church, and Catholic critics stigmatize them as chimerical. His spiritual works, a collection of which (*Œuvres spirituelles*, 5 vols.

12mo) appeared at Amsterdam in 1781, are used by persons of all denominations. His sermons (12mo, 1744), written during his youth, hold no very high place among productions of their kind, though not without eloquent passages. Among his other works are: *Traité de l'éducation des filles* (12mo, 1687), written at the request of the duchess de Beauvilliers; *Traité du ministère des pasteurs* (1688); *Démonstration de l'existence de Dieu* (1713), after "Telemachus" his longest and most important work; and *Dialogues sur l'éloquence en général, et sur celle de la chaire en particulier*, with a *Lettre sur la rhétorique et la poésie*, addressed to the French academy (1718). An edition appeared at Paris in 1787-'92 (9 vols. 4to), at the cost of the assembly of the clergy of France, but does not contain the *Maximes des saints*, the *Mandements*, nor the writings on Jansenism and quietism. The best editions of Fénelon's complete works are those by Gosselin and Caron (34 vols., Versailles and Paris, 1820-'80), Adrien Leclère (38 vols., Paris, 1827-'30), and the abbé Gosselin (10 vols. large 8vo, Lille, 1852). The best editions of his literary works are Didier's (Paris, 1861) and Ducrocq's (1862); of his philosophical works, Charpentier's (Paris, 1843) and Hachette's (1860); and that of his educational works, Didot's (Paris, 1850). Of the English translations of "Telemachus," the most esteemed is that of John Hawkesworth, L.L. D. (4to, London, 1768, and 12mo, New York, 1859). His life has been written by the chevalier Ramsay (the Hague, 1723), his grand-nephew François Louis, marquis de la Mothe-Fénelon (1747), Y. M. de Querbeuf (published with the Paris edition of 1787-'92), Cardinal Bausset (8 vols. 8vo, Paris, 1808-'9; translated into English by Mudford, London, 1810, and abridged by Charles Butler, 1810), Lemaire (Paris, 1826), Célariér (Paris, 1844), Villemain, Lamartine, &c. The *Histoire littéraire de Fénelon, ou Revue historique et analytique de ses œuvres*, by the abbé Gosselin, appeared in 1843. II. **François de Salignac de la Mothe**, a French missionary, half brother of the preceding, born in 1641, died in 1679. He entered the congregation of St. Sulpice, and was sent to Canada in 1667. He was soon after missionary to some Cayuga Indians who had settled on Quinté bay, Canada, and founded an establishment for Indian children. During the collision between church and state he preached a sermon at Montreal in 1674, for which the count de Frontenac arrested him and brought him to Quebec. Fénelon refused to recognize the governor's authority or to remove his hat, on which Frontenac sent him out of the colony to France. The identity of names and profession led Hennepin to confound the two brothers, and some American writers have thus been led to believe that the author of "Telemachus" was a missionary in New York.

FÉNELON, Gabriel Jacques de Salignac, marquis de la Mothe, a French soldier and diplomatist, nephew of the preceding, born in 1688, killed in battle, Oct. 11, 1746. In 1724 he was ap-

pointed ambassador to Holland, and in 1728 represented France at the congress of Soissons. In 1733 he negotiated a treaty of neutrality with the states of Holland. In 1738 he was made lieutenant general, and served under Marshal Saxe. He was mortally wounded at the battle of Raucoux. He wrote *Mémoires diplomatiques*, and published the first complete edition of *Les aventures de Télémaque*, with a dedicatory epistle (2 vols., 1717).

FENIANS, a political association having for its aim the independence of Ireland. The name is derived from the *Fionna* or *Fianna*, an Irish militia or home guard organized in the 8d century, and commanded by Fionn or Finn, who is said to be the Fingal of Ossian. He was slain in battle in 283, and the *Fianna* under his grandson Osgar were practically annihilated during a civil strife in 296. We shall here treat of the acts of the various organizations in Great Britain and the United States, designated under the local names of the "Phoenix Society," "Irish Revolutionary Brotherhood" (I. R. B.), "Fenian Brotherhood," and "Nationalists," but better known as Fenians. The Fenian brotherhood was founded in New York in 1857 by Michael Doheny, John O'Mahony, and Michael Corcoran, subsequently a brigadier general in the Union army. At the same time a kindred organization already existing in Ireland, under the name of the Phoenix society, was developed into large proportions by James Stephens, the funds for its maintenance being sent over from New York. Stephens came to America in 1858, reported the existence of 85,000 enrolled and disciplined followers, and solicited further aid. At a meeting of the "friends of Ireland," called in New York, a fund was raised, and the Fenian brotherhood was formally organized under John O'Mahony as president. Just then several members of Phoenix clubs were arrested in Ireland; and this incident, revealing to Stephens the existence of traitors in his own ranks and the watchfulness of the British government, compelled him to adopt a course of caution and temporary inaction. But the occurrence gave a great impulse to the Fenian cause in America; one of its consequences being the organization of the first "Phoenix" regiment in the United States, Col. Corcoran's 69th New York national guard, which refused to parade at the visit of the prince of Wales in 1860. Stephens, who had taken up his abode in Paris, with large funds at his disposal, was buoyed up by the certainty that his supporters in America were hourly increasing. In Ireland his subordinates covered the provinces with a network of clubs, which met secretly to drill. In 1860 O'Mahony visited Ireland, inspected the most important districts, and held a meeting of the Fenian leaders in Dublin, at which definite plans of action were agreed upon. Stephens forthwith returned to Ireland, and O'Mahony to the United States, the organization receiving from their presence a new

impulse in both countries. The Fenian brotherhood, when O'Mahony was first placed at its head, numbered 40 members, all in New York city; it now extended its ramifications all over the United States, and even into British America and Australia, while in Great Britain it established "circles" wherever Irishmen were to be found. Stephens divided his followers into four classes: A, colonels, in command of battalions; B, captains, commanding companies of 100 men; C, sergeants, at the head of 20 men; D, privates. "Unreserved obedience to orders, absolute discretion in communicating with outsiders, and active zeal in extending the organization," were the main principles inculcated on all. Catholics in Ireland were prohibited by law from possessing firearms; hence one of the great difficulties of carrying out any aggressive movement. But smithies for the manufacture of pikes were stealthily established in many places. This deficiency of firearms, and the want of preconcerted action among the leaders, combined with other reasons, caused the failure of the enterprise in Ireland.—In the United States up to 1863 the Fenian organization was but little known and less understood. Americans saw men assembling by night, and quietly drilling; but they were confounded with the military organizations everywhere existing, and were supposed to be made up of working men who could meet for drill at no other time. The "circles" established in all American cities furnished not a few regiments at the commencement of the civil war. After the first battle of Bull Run, and the return to New York of the 69th regiment, the "Irish Brigade" under Thomas Francis Meagher was formed; the movement was imitated elsewhere, even in the south, and the Fenian element was active in filling up the ranks of volunteer regiments. When in 1862 Michael Corcoran was liberated from a southern prison, his prominent position as a Fenian leader served not a little to draw the organization into the Union ranks, with the ulterior hope of using the military experience thus acquired in the cause of Ireland. This raised the hopes of Stephens and his confederates in Ireland. Early in 1863, T. O. Luby, one of the Irish leaders, came to America, and not only visited in company with O'Mahony the principal Fenian centres in the United States, but was allowed to penetrate the lines of the Union army, and to hold meetings at the headquarters of Irish regiments. This tour raised on both sides of the Atlantic expectations of speedy success. On Nov. 3, 1863, the American organization, or Fenian brotherhood, held its first "national congress" in Chicago, the delegates representing 15,000 enrolled Fenians, one half of whom were in the Union army. This assembly proclaimed the Fenian brotherhood to be strictly in accordance with the laws of the United States, ignored partisan politics and differences in religion, and declared the Irish people to be a distinct nationality, with James Stephens as

its head, to whom, with central officers elected by an annual congress, state officers elected by state organizations, and "centres" elected by circles, the direction of affairs should be intrusted. A grand fair, ostensibly for the relief of Irish sufferers, but in reality to aid the Fenian brotherhood, was held in Chicago at the close of this congress, and contributed a large amount to the treasury. The cause had hitherto had no official organ in Ireland. Immediately on his return to that country, however, was published the first number of the "Irish People" in Dublin, Nov. 28, 1863. The bold utterances of this sheet caused the police to watch every movement at the various centres of Fenian activity. On Feb. 23, 1864, a riot occurred at a public meeting in the Rotunda, Dublin, in which Mr. A. M. Sullivan, who had openly attacked the "I. R. B.," was, together with his adherents, "the national party," ejected by the Fenians. The numbers of the latter, and the perfect discipline with which they acted in their attack on the opposing faction, were a revelation to the authorities, while the victory itself was to the friends of Ireland prophetic of the dissensions destined to mar every attempt at revolution. Stephens again returned to the United States in March, 1864, and visited the different corps of the Union armies, under the pseudonyme of Captain Daly. The prudence and secrecy which always characterized the movements of this leader found but few imitators among his followers. The bravado with which the Irish press in America and the "Irish People" in Dublin spoke of the near liberation of Ireland, and the enthusiasm expressed by the Irish masses at home and abroad, served the British government effectively. Stephens left New York at the end of July, his presence having given an extraordinary impulse to the spread of the brotherhood.—When the second Fenian congress assembled in Cincinnati, Jan. 17, 1865, the circles had increased five fold, and the financial receipts exceeded the total of the seven previous years. A report from an agent sent to Ireland stated that the masses were desirous of revolution, and that the middle classes, though hesitating, would in extremity act with the patriots. The surrender of the confederate armies and the disbandment of the Union forces left free those Irish officers and soldiers on whom were centred mainly the expectations of the revolutionists. Many of these officers now went to Great Britain; and about this time disaffection began to spread among the Irish troops in the British service. It was no longer a secret that the "Fenian conspiracy" had its ramifications all over Great Britain as well as Ireland. On Sept. 8 a proclamation from Stephens was circulated among the circles in Ireland, announcing that the time for action had come. "I speak with a knowledge and authority to which no other man could pretend," he says, in concluding; "the flag of Ireland, of the Irish republic, must this year

be raised!" But every purpose and act of Stephens was made known to the British government. On the night of Sept. 15 a squad of the Dublin police suddenly seized the office of the "Irish People," taking into custody Jeremiah O'Donovan-Rossa, the registered proprietor, and several of the editorial staff and other employees, among whom was Pierce Nagle, who turned crown witness at the subsequent trial. Another squad arrested Thomas C. Luby, the chief editor, at his residence, capturing among other documents a letter addressed to "Miss Frazer," but which in reality was an official document signed by James Stephens appointing a committee of three to govern "the home organization," with the same supreme authority hitherto exercised by himself. There were resolutions also from the brotherhood in America, signed by O'Mahony, formally recognizing Stephens as the chief executive and head of the Irish republic. The next day appeared two proclamations from the viceroy, Lord Wodehouse. The first announced the existence of "the Fenian conspiracy," and offered a reward of £200 for the apprehension of James Stephens; the second declared military law in the city and county of Cork, and offered another reward of £200 for the apprehension of one Geary. Simultaneously with the arrests in Dublin, which continued daily for several weeks, others were made in different parts of Ireland. In England, at the same time, several leading Fenians were arrested in Liverpool, Manchester, and other cities. On an American steamer landing at Queenstown, C. U. O'Connell, an aide-de-camp of O'Mahony, was taken into custody, and upon him were found papers incriminating many persons. The utmost energy was displayed by the British authorities; vessels of war were despatched to the principal seaports, and a cordon of gunboats surrounded the Irish coasts. Stephens, under the name of James Herbert, had occupied a villa near Dublin, where on the night of Nov. 11 he with three others was arrested by the police. He was committed to prison, whence he escaped on the 24th of the same month, and finally reached France. Bills of exchange in large amounts from the Fenian treasury in New York to the Irish leaders had fallen into the hands of the government.—No sooner had tidings of this reached the United States than the "central council of the Fenian brotherhood," sitting in New York, summoned the third congress, which assembled in Philadelphia, Oct. 18. During its sitting, P. J. Meehan, editor of the "Irish American," and accredited agent to the brotherhood in Ireland, returned, and reported the home organization as "powerful, the management masterly, and the position solid," and this at the very moment when the Irish revolutionists were utterly helpless. To this congress 850 circles, representing 30 states, sent deputies, and among the circles those styled "army and

navy" had 14,620 members. This session of the third congress authorized the establishment of a "Fenian sisterhood," which spread rapidly, and proved a successful auxiliary in raising funds. It also adopted a new constitution, creating a president, secretaries of departments, a senate and house of representatives, and authorized the issue of bonds of the Irish republic. A deputation from this "convention of Irish-American citizens" obtained from President Johnson the release from Fortress Monroe of John Mitchel, who had been confined as a prisoner of state. He was despatched to Europe as the accredited agent of the brotherhood, and bore with him a large sum of money in aid of the struggle in Ireland. After the adjournment of this congress public offices were opened in New York, and the issue and sale of bonds were actively carried on for some time. But a fatal dissension now manifested itself between O'Mahony and the newly created senate. Meanwhile events in Ireland were hurrying onward. The special commission to try the Fenian prisoners commenced in Dublin Nov. 27. O'Donovan-Rossa was sentenced to penal servitude for life, and Luby and O'Leary for 20 years. The judges then proceeded to Cork, where similar punishments were dealt out. In the mean time the rupture in New York between O'Mahony, who had been created president of the whole brotherhood, and the majority of the senate, had been gradually widening. He and his friends wished to operate in Ireland, while the senate favored the scheme of an armed expedition into Canada, and henceforth were designated by their opponents as the Canada party. On Jan. 2, 1866, the fourth Fenian congress assembled in New York. More than 400 delegates attended from Canada, Australia, and all parts of the United States. The old constitution was restored and O'Mahony reinstated as head centre. These proceedings were accepted by a military convention held in New York, Feb. 22; but the hope of a permanent reconciliation soon ended in a worse misunderstanding. The sentences pronounced in Ireland on the prisoners did not seem to damp the courage of the Fenians. On Feb. 24 Lord Wodehouse wrote to the English home secretary that as many as 500 Irishmen from America, "thoroughly reckless, and possessed of considerable military experience," were known to be engaged in swearing in members throughout the country; adding: "The disaffection of the population is alarming, and is day by day spreading more and more through every part of the country." Parliament on Feb. 17 suspended the habeas corpus act. A large number of arrests were made in Dublin, and before the end of March 670 persons had been taken into custody, the number reaching 756 at the accession of the Derby ministry in July. The excitement of the Irish element in America became uncontrollable. Meetings were held in the chief cities, and the central office in New York was

urged to immediate action. O'Mahony was at length formally impeached and deposed by the senate, and Col. William R. Roberts was elected in his stead. While Roberts was preparing to move on Canada, O'Mahony was induced to consent to an attempt to occupy the island of Campo Bello, New Brunswick. A steamer was purchased in New York early in April for the purpose of carrying arms to Eastport, Maine, a few miles from Campo Bello. The command of the expedition was assumed by Major B. Doran Killian. Five hundred men quietly gathered at Eastport, and awaited the arrival of the steamer with the arms. But O'Mahony, who was still recognized as president by a portion of the Fenians, had countermanded the sailing of the steamer, and ordered the New York Fenians at Boston to return home. From Portland was now sent a schooner with 750 stand of arms, the offering of Fenian sympathizers; but the arms were seized by the United States authorities, and Gen. Meade having arrived and telegraphed for troops, the Fenians dispersed and made their way home as best they could. On May 10 Stephens arrived in New York, apparently confident that both parties would yield to his leadership. O'Mahony, in order to facilitate a reunion, gave in his resignation, which was accepted, and Major Killian was removed from his command. The Roberts party immediately came to an issue with Stephens on the proposed invasion of Canada. This Stephens decidedly opposed, urging that all present efforts should be to raise money for the purpose of helping "the men in the gap" in Ireland. These men, he said, numbering hundreds of thousands, needed only money to win their independence. All this while both factions continued bitterly to assail each other's motives and acts. Under the military direction of Gen. Thomas W. Sweeny, an officer of the American army, the Roberts party began to act about the middle of May. On the 19th 1,200 stand of arms were seized at Rouse's Point, near the Canadian frontier, by the United States custom-house officers. From the 29th to the 31st bodies of Fenians from various points of the west and southwest moved toward Canada, and a new seizure of arms was made at St. Albans on the 30th by the United States authorities. The Canadian government put the entire militia of the western provinces under arms, and they took the field under Sir John Mitchell, while companies of volunteers and regulars were sent to the various threatened points. On June 1, 1,200 or 1,500 Fenians under Col. O'Neill crossed the Niagara river at Buffalo and took possession of an unoccupied work called Fort Erie. On the 2d they were attacked at a place called Limestone Ridge, and held their position, losing several killed and wounded and many prisoners. They withdrew the same night, and 700 were intercepted by the United States gunboat Michigan. Subsequently Gen. Barry, in command of the frontier, paroled 1,500 upon their

promising to return to their homes, and to desist in future from any violation of the neutrality laws; the officers being required to give bail to appear and answer when required for an infraction of the laws. The Fenians continued to pour into Buffalo, but were ordered back by their commanding officers. Along the frontier of Vermont Gen. Meade concentrated a large force of United States troops. The president issued a proclamation of neutrality, and gave orders for the arrest of the Fenian leaders. On June 7 Gen. Sweeny and his staff were arrested in St. Albans, Roberts in New York, and several others in Buffalo. Roberts having refused to give parole or bail, was detained in jail for several days, and then released. During this period large sums of money were contributed; and the proposed rising in Ireland was made the occasion of a "final call" for funds, issued Aug. 25, 1865. From that date up to April, 1866, the sum of \$250,000 was contributed by the Fenian brotherhood, of which the British government intercepted \$42,000, and \$3,500 were lost by an agent in Ireland. To counteract the effect of these disasters Stephens pledged his word that there should be a fight in Ireland within the coming year. In September Roberts summoned a congress in Troy, which was numerously attended. The case of Col. R. B. Lynch and a priest named McMahon, who had been taken prisoners at Limestone Ridge, tried, and condemned to death, served for a time to keep alive public attention in the United States; but through the good offices of the American government, these sentences were commuted. In December Stephens called a meeting of Fenian centres in New York, in which future plans of action in Ireland were discussed. He was opposed to any overt attempt under present circumstances; and to convince his followers that his advice was not the result of personal fear, he professed his readiness to go at once to England and allow the British authorities to do their worst upon him. But while rejecting this offer, the party of action would not accede to their chief's prudent counsels. About 50 persons were sent, in conformity with the promise of another rising wrung from Stephens, as "commissaries" to Great Britain; among them were the two "centres" Kelly and Deasy, and Godfrey Massey.—The invasion of Canada, the publicity given in America to the designs of the Fenian leaders, the agitation fostered on both sides of the Atlantic on the occasion of the condemnation to death of Lynch and McMahon, and above all the exact information obtained by the British authorities from agents in the Fenian ranks, caused a second suspension of the habeas corpus act, Aug. 10. A reward of £2,000 was offered in November for the apprehension of Stephens, said to be on his way to Ireland; fresh regiments were sent to the latter country; and 97 leading emissaries of the brotherhood were arrested and imprisoned under the viceroy's warrant. It there-

fore behooved Massey and his confederates to be wary. Having resolved to make England the principal field of action, they established a "central directory" of 15 members in London, while subordinate directories were formed in Liverpool, Manchester, Birmingham, Leeds, and Glasgow. Massey, after making a tour of inspection in Ireland, reported the organization there to be so numerous and well appointed that a rising was forthwith resolved upon, and a plan of campaign adopted. The castle of Chester was garrisoned by a company belonging to an Irish regiment, and in it was stored a considerable quantity of arms and ammunition. A plan was formed to seize these, and the 11th of February was fixed upon for its execution. On the 10th the directory met in Liverpool to arrange the last details for the morrow's operations. At midnight the magistrates of Liverpool were fully informed of everything by one Congdon, who exhibited a commission in the Union army and another in the Fenian service. In less than half an hour the mayor of Chester was warned of his danger, and he hastened to post a strong body of men in the castle. From 2½ A. M. every train arriving in Chester brought many Fenians, until their number reached some 1,200 at 4½ P. M. At that hour a company of regular troops arrived from Manchester, and a regiment of the guards was promised from London. Numbers of special constables had meanwhile been sworn in and armed. The Fenians saw they had been betrayed, and after some futile demonstrations dispersed under cover of night. It was now impossible for the directory to countermand in time the simultaneous rising in Ireland, where the government had also been informed of everything, and had taken precautionary measures. Killarney had been chosen as the centre of Fenian operations in the south, and Capt. O'Connor was intrusted with the command. But at noon on Feb. 12 the frigate *Gladiator*, at anchor in Valentia bay, landed her marines to protect and assist the coast guard. At the same hour Capt. Moriarty was taken prisoner, and a body of 800 Fenians were dispersed without any serious resistance. Another large body withdrew into the Toomies mountains, but fled before the advance of the military. The attack on Chester castle and this rising in the south of Ireland were, in the conception of the directory, only preliminaries to a general insurrectionary movement throughout Ireland, which was to take place on March 5. This, it was commonly believed, was the day fixed in Canada for the execution of Fenian prisoners. But on March 8 Godfrey Massey, who had come over from England with final instructions, was taken prisoner at Limerick station. He divulged to the British government everything pertaining to the present plans and organization of the Fenian body, and its history. However, on the 5th the rising took place in Dublin, in accordance with the orders issued by the leaders. After dark, along every road which led from the capital

and the neighboring towns to Tullaght hill, numerous bodies of men were seen advancing in silence, and arming themselves at certain places on their way. A band of mounted policemen attacked and drove back a column of several hundred Fenians, who in the darkness, unaware of the extent of the attacking force, were stricken with a panic which became general. About the same hour a body of 1,000 partly armed men took possession of the police barracks and the city hall of Drogheda, and held them throughout the 6th; but finding no sympathy among the citizens, they disappeared during the night. In Munster the insurrection was pretty general; but beyond tearing up railway tracks, destroying telegraphic lines, and attacking isolated posts of constabulary and coast guards, nothing came of the movement in the south of Ireland. A considerable force of insurgents took refuge in the Galtee hills, whence they were soon driven by a heavy fall of snow. The special commission appointed to try the Fenian prisoners began its session in Dublin on April 8. In the subsequent trials T. F. Burke was condemned to death in Dublin, and John McCafferty in Cork, but their sentences were afterward commuted to penal servitude for life.—Stephens had meanwhile been relieved of the management of the Fenian organization, and the direction was vested in a committee until the fifth congress met in New York, Feb. 27, 1867. It elected as central executive A. A. Griffin; much money was raised and many measures were projected to aid "the men in the gap." The president of the United States was vainly appealed to for the purpose of obtaining belligerent rights for the Fenians. Toward the end of May a second invasion of Canada began to be talked of. Large bodies of men were seen drilling in Detroit and Buffalo, and recruiting offices were kept open by the Fenians; and St. Albans and Ogdensburg were spoken of as depots of military stores and points of departure for a new expedition. But the United States authorities exerted the utmost vigilance, and orders were issued on July 30 for the arrest of all who should attempt any violation of the neutrality laws. The parent organization of the Fenian brotherhood had, however, despatched in April an expedition to Ireland. On April 18 the brig *Erin's Hope* sailed from New York with 5,500 stand of arms, 8 batteries of artillery, 1,000 sabres, 5,000,000 rounds of small ammunition, a large supply of artillery ammunition, equipments for a brigade, and 89 officers of every grade of infantry, cavalry, artillery, and engineers. On May 18 she made Black Rock, 12 miles from the mouth of Donegal bay, and in a week got into communication with parties on shore. She remained 20 days on the coast of Ireland and four on that of England, and made three landings on the former and one on the latter. Several of the officers set ashore were captured; but the military stores were brought back to New

York. The return of the *Erin's Hope* prevented the sailing of a second vessel already half fitted up. Meanwhile a "provisional government" had been directing the movements of the home organization. In June, 1867, three of the directors brought against the fourth charges which compelled the dissolution of that body in July. Toward the end of that month a convention of delegates in Manchester elected Thomas J. Kelly central executive of the Irish republic. This did not meet the approval of the revolutionists, and another convention in the following winter appointed a supreme council of the I. R. B., consisting of seven members. Thus arose in the home organization a division similar to that which paralyzed the Fenian brotherhood in America. The sixth national congress of the Fenian brotherhood, embracing delegates from 18 states and the British provinces, assembled in New York Aug. 21. The object of this convocation was to reconstruct the brotherhood to meet the altered aspect of affairs in Ireland. The constitution was slightly amended, and John Savage was made chief executive. He found the treasury not only empty but several thousand dollars in debt, and saw that neither the time nor the means warranted armed collision. He therefore proclaimed a new era, to be based on discipline, obedience, and intelligence.—The directory in England now set about "organizing militarily" the Irish population throughout Great Britain, in order to keep the government in constant alarm. During the night of Sept. 13-14 the police of Manchester attempted to arrest four men of suspicious appearance; two of them escaped, and the others proved to be Col. T. J. Kelly and his aid, Capt. Deasy. On the 18th the van in which they were conducted to prison was attacked, the prisoners were rescued, and Sergeant Brett, in charge of the van, was killed. Subsequently five persons, Allen, O'Brien, Larkin, Maguire, and Condon, were arrested, tried in Manchester, and condemned to death (Nov. 18), though protesting their innocence. From the moment of Brett's assassination every city in Great Britain was kept in a state of excitement and alarm, and several depots of arms and ammunition belonging to volunteer regiments were seized by the Fenians. This excitement culminated with the condemnation of the Manchester prisoners. Efforts were made to obtain a commutation of the sentence of the chief offenders; but neither the home secretary nor the queen would receive the deputations sent to them, nor were the attempts made to carry an appeal to a higher court more successful. Allen, O'Brien, and Larkin were executed Nov. 23, Maguire and Condon having been reprieved. On Nov. 24 the Irish population of Manchester and London turned out *en masse* to march in funeral procession in honor of the dead. A week later Dublin witnessed a similar and more imposing pageant. The 3d of December

had been appointed for like demonstrations in Liverpool, Leeds, Glasgow, Cork, and Waterford; but the authorities forbade them. On Nov. 23 Col. Burke, a well known Fenian leader, was arrested by the London police, and with him one Casey, who had made a most determined effort to rescue him. They were both lodged in Clerkenwell bridewell. On Dec. 18, between 2 and 3 o'clock P. M., a barrel of powder which had been brought through the narrow and populous Corporation lane to the foot of the high wall enclosing the prison exploded, blowing down the wall, shattering all the neighboring houses, killing 6 persons on the spot, and wounding 120 others, 11 of whom subsequently died; but the escape of Burke, the supposed object of the explosion, was not effected. Amid the universal alarm and indignation, incendiary fires broke out in various parts of London. Thousands of special constables were sworn in daily in London for several weeks, until the number amounted to 50,000. The other cities containing any considerable Irish population followed this example. Five men and one woman were subsequently arrested for complicity in this outrage, one of whom, Michael Barrett, was found guilty of murder. The Fenians did not abate their activity in Ireland after the executions in Manchester and the Clerkenwell explosion. A large number of revolvers had found their way into the hands of the initiated. On Feb. 7, 1868, Capt. Mackay (Lomasney), who had been the foremost leader in the March insurrection of the last year, was arrested in Cork with several others. The arrest led to riotous assemblages, in which firearms were used, and which were speedily suppressed. The Irish residents of London on Feb. 11 presented an address to the queen expressive of their loyalty, and repudiating the acts of the Fenians; it was signed by nearly 23,000 persons. Two events also occurred in the following months which alienated much sympathy from the Fenian cause. On March 11 the duke of Edinburgh was dangerously wounded by a man named O'Farrel in Port Jackson, Australia. The assassin, though accused of being a Fenian, protested with his dying breath that he was not. On April 7 Thomas Darcy McGee, a member of the Canadian ministry, was killed on the steps of his own door; his opposition to Fenianism was alleged as the motive for the deed. These events so wrought on the public mind in England, that every effort made to obtain a commutation of the death penalty in the case of Michael Barrett utterly failed, and he was executed, May 26. They had also an effect on the trials of Burke and Mackay, who were sentenced to 15 and 12 years' penal servitude. The conviction had now become general that Fenianism was crushed. On July 31 the queen in closing the session of parliament declared that "the cessation of the long continued efforts to promote rebellion in Ireland has for some time rendered unnecessary the

exercise by the executive of exceptional powers. I rejoice to learn that no person is now detained under the provisions of the act for the suspension of the habeas corpus, and that no prisoner awaits trial in Ireland for an offence connected with the Fenian conspiracy."—The seventh Fenian congress assembled in New York, Aug. 24, 1868, and on the next day a "union convention of independent circles and clubs" met in the same city to devise means of ending the division in the Fenian ranks. Both bodies agreed in creating a commission to proceed to Europe, and endeavor to harmonize the conflicting claims for the control of the "home organization," and to secure a governing body on the American elective principle, which would represent officially all the "nationalists" in Great Britain and Ireland. Mr. Savage was chosen for this mission, and proceeded at once to Paris, where in a conference held in January, 1869, the project was successfully carried out. It now became the purpose of the Fenian leaders in America and Ireland to obtain the release of their imprisoned friends, and to induce the United States government to interfere in favor of several of them who were naturalized citizens. The corporation of Dublin proceeded to London in a body, and appeared, with the lord mayor at its head, at the bar of the house of commons, with a petition of amnesty for the prisoners. The English government, yielding to these solicitations, granted a free pardon to several. The combined and persistent efforts made in favor of amnesty for the prisoners were coupled everywhere with a demand for tenant right. This double agitation assumed such proportions that in the autumn the government sent additional regiments to Ireland. In the United States the Fenian brotherhood was legally chartered in August, under the act incorporating benevolent societies. The eighth congress assembled in New York, Aug. 25, 1869. Mr. Savage reported the union effected between the branches of the brotherhood in Great Britain and Ireland, and the progress both in numbers and character made by it in the United States. He also denied officially a report that Fenianism had entered into a league with European socialism. This year 1869 was rendered memorable by the disestablishment of the Irish church, and this measure was followed up by the passage in 1870 of an Irish land bill. The Fenians claim both these measures as the legitimate offspring of their efforts; and some English statesmen avowed that they were the necessary consequences of the Fenian agitation. The rigors to which the Fenian prisoners were subjected furnished a fertile topic for continued agitation. The subject had been brought before congress in December, 1869; and on Feb. 10, 1870, the house of representatives by resolution condemned such cruelty, and urged the president to interfere in behalf of the victims. In Ireland J. O'Donovan-Rossa, while a prisoner, had been elect-

ed to parliament for the county of Tipperary; the election was declared void, and Mr. C. J. Kickham, a recently released Fenian convict, was proposed for the vacancy, but failed of election. Thus was the popular sentiment kept in continual effervescence among the Irish in Great Britain, while in the United States the senate party on May 24 assembled another expedition on the Canadian frontier. President Grant lost no time in issuing a proclamation against the raiders, and Gen. Meade hastened to the border to enforce it. Col. O'Neill and several of his officers were imprisoned, and the men and arms were seized by the United States authorities. The ninth congress of the Fenian brotherhood assembled in New York on Aug. 30. O'Neill, in his prison in Windsor, Vt., signed an agreement on Sept. 7, in the name of his adherents, by which they were reunited to the parent society. The British government, after witnessing this last impotent effort at invasion, and passing the Irish land bill, granted in December a partial amnesty to the political prisoners, on condition that they should quit British soil for ever. In February, 1871, Mr. Savage insisted on laying down his charge in the brotherhood; his resignation was accepted by the tenth congress on March 21, and the office was abolished, and the direction vested in an executive council. A committee appointed to investigate the past financial affairs of the brotherhood reported that the total amount received in a little more than 12 years was \$626,043, of which \$425,254 were "expended for Irish revolutionary purposes direct," and \$197,669 were "expended in America." The report states that of the amount expended in America, at least two thirds were not for organizing purposes and office salaries, but "for objects indirectly connected with the cause of the revolution in the British islands, such as the purchase of arms and vessels, the pay of armors, the rent of armories, the support of men sent here on duty from Ireland, the relief of refugees (a vast sum), and the support of the families of some of the officers and men sent on duty to Ireland and England." The 11th Fenian congress, which met Aug. 20, 1872, reduced the number of the executive council to 10, to be elected by congress, including a chief secretary who is the executive officer of the organization, a position at present (November, 1873) held by John O'Mahony.

FENNEC, an African canine animal, resembling a diminutive fox, belonging to the genus *megalotis* (Illiger). So vulpine is its look, that Mr. Gray, in his catalogue of the British museum, calls it *vulpes Zaarensis* (Skiöld.). When first described by Bruce the traveller, its zoological position was so ill determined that Buffon, who gives a good figure of the animal, called it *l'anonymous*; it was referred to rodents and quadrupeds by others; Zimmermann, from the examination of the teeth, seems first to have detected its dog-like affinities, and placed it in the genus *canis*; but whoever dis-

covered its true position, there can be no doubt that it belongs at the end of the canine family of digitigrade carnivora. From the enormous comparative size of the ears Illiger established the genus *megalotis*, which does not appear to differ much from *vulpes*; taking this well selected name of the genus, and the name of its first scientific describer for the species, it may properly be called *M. Brucei* (Griff.). According to Bruce, the animal is 9 or 10 in. long, with a foxy snout, ears half as long as the body and broad in proportion; the color white, mixed with gray and fawn color; the tail yellow, dark at the end, long, with soft and bushy hair like that of a fox; the ears thin, and margined with white hairs. The dentition, general appearance, and habits are canine; the feet are four-toed, with the rudiment of a fifth, and the nails are not retractile as Desmarest at first supposed. It inhabits northern Africa, particularly Abyssinia, Nubia, and Egypt. There seems to be a second species, nearly allied to but different from Bruce's fennec, the *M. Lalandi* (H. Smith); this is gray, with

into finely cut and almost hair-like teguments; its flowers are yellow, and the stalks of the plant are glaucous. Once introduced into the garden, it propagates itself for years. A more attractive kind is the *finocchio* or Azorean fennel (*F. dulce*), an annual cultivated in Italy as

Fennec (*Megalotis Brucei*).

the hairs of the dorsal line longer and blacker than the rest, and the tufted tail black with a gray base. Rüppell gives the discovery of the first species to Skiöldebrand, a Swede, whom Bruce accuses of supplanting him by an unworthy artifice; he calls the fennec *canis zerda* (Zimm.), and makes it 23 in. long, including the tail, which is 8 in. It lives in holes which it digs in the sands of the desert, and not in trees as is supposed by Bruce; it is shy, very quick in its motions, and solitary; its food consists mainly of insects, especially locusts, eggs, dates, and other sweet fruits, and probably small animals; its bark resembles that of a dog, but is more shrill; the internal orifice of the ear is said to be very small. It is sometimes called zerda.

FENNEL (*feniculum*, Koel.), a genus of umbelliferous plants, to which the British species (*F. vulgare*, Willd.), found on chalky cliffs in the southern parts of England, belongs. It is cultivated for the sake of the pleasant aromatic qualities of its leaves. It is frequently met with both wild and in gardens in the United States. Its leaves are singularly spread out

Fennel (*Feniculum vulgare*).

celery is with us. Several other species of fennel are known, some of which are admired for their pungency. Two kinds of fennel seed are found in the shops, one being sweeter than the other. It contains a volatile oil of agreeable odor, and is used in medicine as an aromatic. It yields its virtue to hot water and alcohol. The seeds of the shops are obtained partly from this country, but mostly from Germany. The odor of the seed and of the plant is fragrant, and its taste agreeable to most people. The infusion, prepared by adding two or three drams of the seeds to boiling water, is the best form for administering it. It lessens the disagreeable taste of senna and rhubarb, and acts generally as a carminative.

FENTON. I. Edward, an English navigator, born in Nottinghamshire about 1550, died at Deptford in 1608. He served for some time in the English army in Ireland, but joined in 1577 one of Frobisher's expeditions for the discovery of a northwest passage to Asia. The fleet being scattered by storms, Fenton returned to Bristol. Another expedition in which he took part ended disastrously. Early in 1582 he was placed in command of an expedition of four armed vessels, and sailed for Brazil with the ostensible purpose of passing the strait of Magellan. He however put in at St. Vincent, where he destroyed the flag ship of a Spanish squadron. In 1588 he gained much credit as commander of a vessel against the Spanish armada. II. Sir Geoffrey, an English author and statesman, elder brother of the preceding, died in Dublin, Oct. 19, 1608. He received a good education, and acquired literary distinction, especially by translating from the Italian Guic-

ciardini's "History of the Wars of Italy," which he dedicated to Queen Elizabeth (1579). He afterward became the principal secretary of state for Ireland, and exerted great influence in restoring there loyalty and tranquillity. His daughter became in 1603 the second wife of Richard Boyle, the great earl of Cork. He published a number of other works, the best known of which are "Golden Epistles," gathered from the works of Guevara and other foreign authors. **III. ENJAH**, an English poet, of the same family with the preceding, born in Shelton, Staffordshire, May 20, 1683, died in East Hampstead, Berkshire, July 13, 1730. He studied at Cambridge, but becoming a nonjuror he was obliged to leave the university, after which he accompanied the earl of Orrery to Flanders as private secretary. On his return to England in 1705, he was employed in school teaching. Afterward the earl of Orrery confided to him the education of his son, and six years later Fenton became associated with Pope in a version of the *Odyssey*. According to Dr. Johnson, Fenton translated the 1st, 4th, 19th, and 20th books. In 1723 a tragedy entitled "Mariamne" gained him more than £1,000. In 1727 he published a new edition of Milton's works, with a brief life of the author, and in 1729 a fine annotated edition of Waller's poems.

FENTRESS, a N. E. county of Tennessee, bordering on Kentucky, and drained by several affluents of Cumberland river; area, 570 sq. m.; pop. in 1870, 4,717, of whom 170 were colored. The surface consists principally of high table lands of the Cumberland mountains, affording excellent pastures. Timber is abundant, and coal is found in various places. The chief productions in 1870 were 10,339 bushels of wheat, 109,084 of Indian corn, 24,067 of oats, and 11,718 of potatoes. There were 942 horses, 4,624 cattle, 5,021 sheep, and 12,017 swine. Capital, Jamestown.

FENWICK, George, proprietor of part of Connecticut, died in 1657. He came to America in 1636 to take charge of the plantation of Saybrook, so called after Lords Say and Brook, who with others had in 1632 procured a patent for the territory from Robert, earl of Warwick. Returning to England, he came back again in 1639, and from that time, as one of the patentees and agent for the others, superintended and governed the settlement Saybrook till 1644, when he sold its jurisdiction and territory to the Connecticut colony, as his associates had given up their contemplated removal to America. He afterward returned to England, where he became a colonel in the parliamentary army, and was appointed one of the judges of Charles I.

FEODOR, or **Fedor** (Theodore), the name of three emperors of Russia.—**Feodor I.**, born about 1557, died in January, 1598. He was a son of Ivan IV., the Terrible, and succeeded him in March, 1584. Noted for his incapacity, his brother-in-law, Boris Feodorovitch Godu-

noff, became the virtual ruler of the empire, and succeeded to the throne after having caused the assassination of Feodor's brother Demetrius. Feodor himself, the last of the house of Rurik, was believed to have been poisoned.—**Feodor II.**, son of Boris Godunoff, was dethroned and murdered in June, 1605, after a reign of two months, by the partisans of the first pseudo-Demetrius.—**Feodor III.** (also designated II.), elder son of the czar Alexia, born in May, 1661, died May 8, 1682. He succeeded his father in 1676, was engaged in warfare with Poland and Turkey, curbed the power of the nobility, established in 1680 the first Russian school in Moscow, and introduced other reforms. He excluded from the succession his imbecile brother Ivan, and bequeathed the throne to his half brother Peter the Great.

FEODOSIA. See **KAFFA**.

FERDINAND, the name of several European sovereigns, arranged below under the heads of Germany, Naples, Spain, and Tuscany; Austria being included under Germany, Sicily under Naples, and Aragon and Castile under Spain.

I. GERMANY.

FERDINAND I., emperor of Germany, son of Philip I. of Spain and younger brother of Charles V., born at Alcalá, Spain, in 1503, died July 25, 1564. After the death of his grandfather, the emperor Maximilian I., he received as his share of the dominions of the house of Hapsburg the duchy of Austria and other German possessions. In 1521 he married Anna, sister of Louis II., king of Hungary and Bohemia, who in 1526 fell at the battle of Mohács and left no issue. Ferdinand claimed the right of succession in the name of his wife, and by right of previous family compacts. The states of Bohemia acknowledged him, but in Hungary a strong party declared for John Zápolya, waywode of Transylvania. Ferdinand marched against Zápolya, and his general Nicholas von Salm defeated him near Tokay; but the latter soliciting the aid of the Turks, Sultan Solymán espoused his cause. Ferdinand was forced to retreat to Vienna, where he was besieged by the Turks in 1529. After a long and bloody war a treaty was concluded, by which it was agreed that Zápolya should preserve the title of king of Hungary during his life, together with the districts then in his possession, after which they were to pass to Ferdinand. This treaty, however, owing to the prevailing influence of the Turks in Hungary, was not carried into effect, and the eastern parts of the country remained in possession of Zápolya's successor, as prince of Transylvania. In 1581 Ferdinand was elected king of the Romans; and on the abdication of Charles V. in 1556, he succeeded him in the empire. Pope Paul IV. refused to acknowledge him, on the ground that Charles V. had not obtained his permission to abdicate. Paul died before serious consequences had resulted from his refusal, and his successor, Pius IV., rec-

ognized Ferdinand. The electors, both Protestants and Catholics, met and decided that thereafter it should no longer be required of the emperors of Germany to receive the crown from the pope, thus putting an end to the many controversies and wars of which the dependence of the German emperor on the see of Rome had been the cause. In Bohemia Ferdinand arbitrarily declared the crown hereditary in his family without the sanction of the states. A portion of the population opposed him by force of arms, but the insurrection was suppressed. He was tolerant to the Protestants, and tried to effect a union between them and the Catholics by inducing them to send deputies to the council of Trent. He also endeavored to obtain from the pope the use of the cup for the laity in the communion, and the liberty of marriage for the priests. He was succeeded in the empire, as well as in Hungary and Bohemia, by his son Maximilian II.

FERDINAND II., emperor of Germany and king of Hungary and Bohemia, born July 9, 1578, died in Vienna, Feb. 15, 1637. He was the son of Charles, duke of Styria, third son of Ferdinand I. He was a zealous Catholic, and is said to have made a vow at Loretto that he would exterminate Protestantism. His cousin Matthias, emperor of Germany and king of Hungary and Bohemia, abdicated in his favor the crown of the latter country in 1617, and procured his election as king of the Romans and as his successor in Hungary. The states of Bohemia refused to acknowledge Ferdinand, and a powerful Protestant rising was organized, at the head of which was Count Thurn. Shortly after the death of Matthias (March, 1619), Ferdinand was besieged in Vienna, the insurgents threatening to shut him up in a monastery, and cause his children to be educated as Protestants. He however remained firm, and being relieved by the timely arrival of loyal troops, repaired to Frankfurt and claimed the imperial crown. He received the votes of all the Catholic electors, and was crowned emperor. The states of Bohemia now offered the royal crown to the elector palatine, Frederick V., son-in-law of James I. of England. Hungary united with Bohemia against Ferdinand, and Bethlen Gábor of Transylvania joined his enemies. This was properly the beginning of the thirty years' war. Ferdinand was supported by Spain, and Frederick was totally defeated at the battle of Prague in 1620, and driven into exile. Ferdinand was now acknowledged as emperor of Germany and king of Bohemia. He abolished the constitutional charter of Bohemia, and undertook most violent measures against the Protestants; but the latter strengthened their league in Germany by placing Christian IV. of Denmark at its head (1625). The imperialists, under Tilly and Wallenstein, were victorious in several campaigns; and the war was temporarily closed in 1629 by the peace of Lüneburg. Ferdinand now redoubled the severity of his measures against

the Protestants, when he received a formidable check by the intervention of Gustavus Adolphus of Sweden in 1630. The Protestants were upon the whole successful until the death of Gustavus at the battle of Lützen, Nov. 6, 1632. The victory at Nördlingen in 1634 was the last great success of Ferdinand's army.

FERDINAND III., emperor of Germany and king of Hungary and Bohemia, son of the preceding, born at Gratz in Styria, July 20, 1608, died at Vienna, April 2, 1657. He succeeded his father in 1637. From him he also received the inheritance of the thirty years' war, which soon took the aspect of a political rather than a religious conflict, Spain taking part with Ferdinand and France with the allied Protestants. The war was closed, as far as Germany was concerned, by the treaty of Westphalia, Oct. 24, 1648, although hostilities were still carried on between France and Spain. By this treaty Ferdinand gave up most of Alsace to France and a part of Pomerania to Sweden, recognized the independence of the Swiss confederation, restored to the son of the elector palatine Frederick V. a portion of his father's possessions, and acknowledged the rights of his Protestant subjects. He was succeeded by his second son, Leopold I.; the elder, crowned in 1658 king of the Romans as Ferdinand IV., having died in 1654.

FERDINAND I., emperor of Austria, and king of Hungary and Bohemia as Ferdinand V., born April 19, 1793, died June 29, 1875. His father was Francis I. (II.), who in 1806 resigned the title of emperor of Germany, having assumed that of hereditary emperor of Austria. Ferdinand was crowned as future king of Hungary in 1830, in 1835 succeeded his father, and in 1836 was crowned in Bohemia. His character was weak, and he was a mere tool in the hands of his minister, Prince Metternich. Disheartened by the troubles of 1848, he resigned the crown in favor of his nephew, Francis Joseph (Dec. 2), and took up his residence at Prague.

II. NAPLES.

FERDINAND I., king of Naples, illegitimate son of Alfonso the Magnanimous, born about 1424, died Jan. 25, 1494. His father, who had ruled both Naples and Sicily, as well as Aragon and Sardinia, bequeathed to him at his death in 1458 the throne of Naples. His reign was troubled, and the nobles conspired to aid John of Anjou in a descent upon the country. Ferdinand lost the battle of Nola in 1460, escaped to Naples with but 20 followers, and was reduced to the last extremity. He was, however, favored by Pope Pius II. and by Francesco Sforza, duke of Milan; and his partisans were greatly strengthened by the alliance of the Albanian chieftain Scanderbeg, who put himself at the head of the army of Ferdinand, defeated John of Anjou at Troja in 1462, and forced him to leave Italy. Ferdinand was cruel and revengeful. Count Piccinino was one of his illustrious victims. In this reign

the Turks made a descent upon Italy and captured Otranto in 1480, but Ferdinand recovered this city from them in 1481. Five years later the nobles revolted, and Ferdinand, after yielding to their demands, refused to fulfil his promises, and put the leader of the revolt to death. He was excommunicated by Pope Innocent VIII. in 1489, but regained his favor in 1492, and died while the formidable expedition of Charles VIII. of France was preparing to set out toward Italy.

FERDINAND II., king of Naples, grandson of the preceding, and son of Alfonso II., born about 1463, died in 1496. His father, feeling himself universally detested, abdicated in his favor in 1495; but the people had conceived such a dislike for the house of Aragon, that Ferdinand's kindness toward them was treated only with derision. Many of his cities having sent ambassadors to the invading enemy, Charles VIII. of France, he renounced his throne, and took refuge in Ischia. But as soon as Charles left Naples the people recalled Ferdinand, who obtained money and soldiers from Venice in exchange for several Adriatic towns, and reconquered his kingdom. With the permission of Pope Alexander VI. he married his father's sister.

FERDINAND III. See **FERDINAND V.** of Spain.

FERDINAND IV., king of Naples (afterward king of the Two Sicilies as Ferdinand I.), born in Naples, Jan. 12, 1751, died there, Jan. 4, 1825. When in 1759 his father, King Charles, became king of Spain, he succeeded him upon the throne of Naples, in accordance with the recent treaties of Utrecht, Madrid, and Vienna, which prohibited the reunion of the two crowns in any one prince of the house of Bourbon. Ferdinand being only eight years old, Marquis Tanucci was appointed regent. In 1768 he married Carolina Maria, daughter of the empress Maria Theresa, and left the affairs of government to his imperious wife and her favorite minister Acton. The cabinet of Madrid lost all influence over the court of Naples, which closely allied itself with the cabinets of Vienna and London, and joined the first coalition against France. Though forced in 1796 to make peace with France, Ferdinand renewed the war after the departure of Napoleon to Egypt. Austria, Sardinia, Tuscany, and Naples formed a league, and Ferdinand hurried to occupy Rome (November, 1798); but not receiving much aid from his allies, he withdrew before the arms of the French, who in 1799 entered Naples soon after Ferdinand with his family had escaped in an English fleet to Palermo. The Parthenopean republic was established in Naples, but after a few months Ferdinand was restored to his capital by a Calabrian army under Cardinal Ruffo. A terrible inquisition now began against the republicans, the city was abandoned to the lazzaroni, and Ferdinand seemed to have returned only to shed the blood of his subjects. The successes of the French in Germany and Italy obliged

him in 1801 to sign a treaty surrendering a portion of his territory, and to support French troops in the remainder, thus putting Naples under the domination of France. War breaking out in 1805 between France and Austria, Queen Caroline thought it a favorable opportunity for throwing off the French yoke, and prompted Ferdinand to violate the treaty and to receive the support of an Anglo-Russian army. Hardly had he done this when Austria, conquered at Austerlitz, assented to the treaty of Presburg. Before its conclusion Napoleon sent an army against Naples, which obliged Ferdinand and his queen again to take refuge in Sicily, refused offers of negotiation, and on Dec. 25, 1805, declared that the house of Bourbon had ceased to reign over that kingdom, and gave the throne first to his brother Joseph, and in 1808 to his brother-in-law Murat. Ferdinand, protected by England, was able to save Sicily from French conquest; but the queen, as little willing to bear English as French supremacy, embroiled herself with the English ambassador, Lord William Bentinck, was obliged to leave the island in 1811, and died in Vienna in 1814. Ferdinand was in 1812 forced to proclaim a constitution, and finally to resign his government to his son Francis. After Murat was dethroned by Austria in 1815, Ferdinand was restored to his former throne, and on Dec. 12, 1816, united Sicily and Naples into a single state, under the title of the Two Sicilies. He abolished the constitution which he had granted while in Sicily, but was forced to proclaim the democratic Spanish constitution of 1812 by a rising of the carbonari in 1820. He was soon after reestablished in absolute power by the Austrians.

FERDINAND II., king of the Two Sicilies, grandson of the preceding, born in Palermo, Jan. 12, 1810, died in Naples, May 22, 1859. He succeeded his father Francis I. in 1830, and at once excited the most lively hopes by pardoning several political offenders and introducing economical reforms and liberal measures. Having thus lulled the revolutionary party, he changed his policy, adopting the principles of absolutism; and the history of the kingdom from that time is a history of conspiracies and rebellions, followed by trials, imprisonments, and executions. After many revolts and attempts at revolt in various parts, all Sicily rose in insurrection in January, 1848, and armed bands marched upon Naples to demand a liberal government. A constitution was granted them, modelled after the French charter of 1830; but the double dealing of the court and the impatience of the democrats led to a bloody collision at Naples, May 15, after which Ferdinand dissolved the chambers, annihilated the constitution, and restored the ancient order of things. Toward the close of the year Pope Pius IX. took refuge at Gaëta under his protection, and in 1849 received the assistance of Neapolitan troops against the Mazzini government at Rome; for which service he bestowed

upon Ferdinand the title of *rex piissimus*. The reconquest of Sicily, which had proclaimed its independence, was completed after a protracted struggle. In the contests with the insurgents Ferdinand had ordered the bombardment of his principal cities, and thus obtained the epithet of *bombardatore*, abbreviated into "Bomba," by which he has often been designated. The harshest treatment was exercised toward the political prisoners in Naples, who were estimated by Mr. Gladstone in 1851 to number at least 13,000. At the Paris congress of 1856 Ferdinand was advised to pursue a milder system of government, and to grant a general amnesty, which he declined to do. On Dec. 8 of that year a private soldier attempted to assassinate him. In 1857 the seizure and confiscation of the Cagliari, a Sardinian merchant steamer in which revolutionists had been conveyed to Naples, led to a diplomatic rupture between Naples and Sardinia, France, and England. A few months before his death he proclaimed an amnesty, but with such limitations that only 70 bagnio convicts would profit by it; they were banished for life, and restricted to reside in America.

III. SPAIN.

FERDINAND I., the Great, king of Castile, Leon, and Galicia, born about 1000, died in Leon, Dec. 27, 1066. He was the second son of Sancho el Mayor, king of Navarre. In 1033 he received the hand of Sancha, sister of Bermudo III. of Leon, and the title of king of Castile, which was henceforth recognized as an independent sovereignty. On the death of Sancho in 1035, Bermudo attempted to reannex the new state to his dominions; but he was defeated and slain by Ferdinand in 1037. The young king of Castile forthwith claimed and received the crown of Leon, in right of his queen; and by able management and forbearance he reconciled to his cause many lords who at first had opposed his accession to the throne. He soon gained popularity by his respect for the laws of the country, his maintenance of the ancient *fueros*, and his strict administration of justice. He invaded Portugal and acquired in 1045 a considerable portion of it. From 1046 to 1049 he was engaged in wars against the Moors, and reduced the kings of Saragossa and Toledo to tributaries. His elder brother, Garcia III., king of Navarre, having attacked him in 1054, lost his life in a battle fought near Burgos, in the plains of Atapuerca. By this victory Ferdinand gained several districts which formerly belonged to Navarre, and became the most powerful among the Christian princes in the peninsula. In 1056 he took the title of emperor, to indicate his supremacy in Spain. Toward the centre of the peninsula, he extended the boundary of Castile to the gates of Alcalá de Henares, and carried hostilities into Valencia and Andalusia, compelling the emir of Seville to swear allegiance and to restore to him the relics of St.

Isidro (1063). His last days were spent in extraordinary devotional exercises. Attacked by a sickness which he knew would be fatal, he returned to Leon, and divided his realms between his three sons.

FERDINAND II., king of Leon, Asturias, and Galicia, son of Alfonso VIII., died in 1188. He succeeded his father in 1157, the kingdom of Castile being given to his brother Sancho III. He carried on several successful wars against Portugal and the Moors, and instituted the order of the Christian knights of St. James.

FERDINAND III., saint, king of Castile and Leon, born in 1199, died in Seville, May 30, 1252. The son of Alfonso IX. of Leon by Berengaria, queen of Castile, he was indebted to his mother for the latter kingdom, of which he was placed in possession in 1217. His power being firmly established, he commenced in 1225 against the Mohammedans a career of conquest which effectually broke the Moorish power in Spain. In concert with several other princes he first carried his arms through Murcia and Andalusia. Alfonso, dying in 1230, declared his marriage with Berengaria void, and designated his two daughters by his first marriage as his successors. Ferdinand interrupted his progress for a while to secure the inheritance, which he soon accomplished, and thus permanently united the kingdoms of Castile and Leon. Being now sovereign of Spain from the bay of Biscay to the banks of the Guadalquivir, and from the confines of Portugal to those of Aragon and Valencia, he was enabled to push his conquests with renewed energy. In 1238 he triumphed over Aben Hud, king of Murcia; he then successively obtained possession of Toledo, Cordova, Ubeda, Trujillo, Jaen, and finally Seville, which surrendered Nov. 23, 1248, after a siege of a year and a half. Ferdinand was an unsparing enemy of the Jews and Albigenses who had sought a refuge within his dominions. He founded the university of Salamanca, and was canonized by Pope Clement X. in 1671.

FERDINAND IV., king of Castile and Leon, son of Sancho IV., born in Seville in 1285, died in 1312. He was only ten years old when his father died, and he saw himself assailed at once by his uncle Enrique, who coveted the regency, by Don Juan Nuñez de Lara, who wanted to increase his estates, and by the infantes of La Cerda, who claimed the crown, and who, respectively aided by the kings of Portugal and Aragon, aimed at a partition of the kingdom. In these difficult circumstances the young king was sustained by the ability of his mother, Maria de Molina. She succeeded in dividing his enemies, conciliated the king of Portugal, whose daughter Constanza was married to Ferdinand, and also made an alliance with the king of Aragon. Ferdinand in 1305 made war upon the Mohammedans, gained advantages over them, and took Gibraltar (1309). The order of templars having been

abolished by Clement V., he confiscated their property and shared their spoils with the other orders of chivalry. There is a legend that in an expedition against the Moors, having ordered the two brothers Carvajal to be put to death upon mere suspicion, they cited him to appear with them in 30 days before the judgment seat of God; and within the prescribed time he was found dead on his couch, on which he had been taking his siesta.

FERDINAND V. of Castile, **II.** of Aragon, **III.** of Naples, and **II.** of Sicily, surnamed the Catholic, born at Sos, Aragon, March 10, 1452, died at Madrigalejo, Jan. 23, 1516. The son of John II., king of Navarre and Aragon, and of his second wife Juana Henriquez, he was as early as 1468, through the influence of his mother, declared by his father king of Sicily and associate in the crown of Aragon. On Oct. 19, 1469, he married at Valladolid Isabella, princess of Asturias, the sister and lawful heiress of King Henry IV. of Castile. On the demise of the latter, Dec. 12, 1474, Ferdinand and Isabella were proclaimed joint sovereigns of Castile. Several powerful nobles, among whom were the marquis of Villena, the archbishop of Toledo, and the grand master of Calatrava, aided by the king of Portugal, rose in arms in the name of Juana (called Beltraneja, from her supposed father, Beltran de la Cueva), whom the late king had recognized as his daughter, but who had been set aside by the cortes on a charge of illegitimacy, which was never legally proved. Ferdinand's army gained a decisive victory over them at Toro, and in 1479 a treaty put an end to the civil war, and Juana, deserted by all her partisans, took the veil. John II. having died at the beginning of the same year, Ferdinand inherited Aragon, and thus became the undisputed master of the peninsula, with the exception of Portugal, Navarre (which was given to John's daughter Eleanor), and Granada. His chief policy was to fortify the power of the crown, and he reached his aim principally by reorganizing and increasing the *hermandad* or brotherhood for the suppression of disorder and brigandage, by improving the administration of justice, by acquiring the mastership of the several orders of knighthood, and obtaining the power of appointing the bishops, but above all by means of the inquisition, which served not only as a guard against heresy, but also as a political institution to keep the nobility and clergy in check. The intolerance was perhaps still greater against the Jews than the relapsed heretics. On March 31, 1492, an edict for their expulsion was issued by the sovereigns at Granada. The number thus driven forth is estimated by some as high as 800,000, but by others, according to Prescott with more probability, at 160,000. They sought refuge in Portugal, France, Italy, Africa, and the Levant. Before this, however, Ferdinand and Isabella had succeeded in accomplishing their long cherished design of destroying the last vestige

of Moorish power in Spain. The kingdom of Granada, all that remained of the once powerful empire of the Moors, succumbed to the assaults of the Christian warriors; the city itself, the siege of which was conducted by the king and queen in person, surrendered Jan. 2, 1492, after a heroic resistance; and the last of its sovereigns, Abdallah or Boabdil, retired to Africa. When the Moors attempted a revolt in 1501, Ferdinand ordered them to become converted or to leave the kingdom, and it is said that from then till the time of Philip about 3,000,000 Moors left the country. In the discovery of America by Columbus Ferdinand had little if any share; he evinced no disposition to assist the discoverer, and the glory of having aided him belongs exclusively to Isabella. Charles VIII. of France having conquered the kingdom of Naples in 1494, Ferdinand sent thither in the following year his great general Gonsalvo de Cordova, and within a few months the French were expelled and the Spaniards got a foothold in Italy, which advantage they afterward improved. In 1500 he concluded a treaty of alliance with Louis XII. of France, by which the two monarchs divided between themselves beforehand the kingdom, which was to be conquered by their united forces; but scarcely was this accomplished when the allies quarrelled, and Gonsalvo de Cordova for the second time drove the French out of southern Italy (1503-'4), which thenceforth remained in the hands of Ferdinand, as king of Naples and Sicily. Family difficulties interfered for a while with his power and the progress of his conquests. Juana, the only daughter left to him (Isabella having been married to Emanuel of Portugal, and Catharine to Prince Arthur and afterward to Henry VIII. of England), had been married in 1496 to the archduke Philip, son of the emperor Maximilian; and on the death of Isabella in 1504, this young prince claimed the regency of Castile in the name of his wife. This brought on a contest between him and his father-in-law, which terminated in favor of Ferdinand, who was appointed regent in place of the young heir Charles on account of the premature death of Philip in 1506 and the insanity of his wife Juana. The king now found himself at liberty to give undivided attention to the affairs of Italy, and exercised there a paramount influence, not by his arms only, but by his superior political talents. He took part in the league of Cambrai against Venice in 1508; then in the holy league in 1511 against the French, whom the princes of Italy desired to expel from the peninsula; and in all these transactions he was generally the gainer. Besides the kingdom of Naples, he added to his dominions several towns and fortresses on the coast of Africa, which were conquered by Cardinal Ximenes and Count Navarro in 1509 and 1510, and the kingdom of Navarre, which he wrested from Catherine de Foix and her husband Jean d'Albret in 1512. By a singular

whim, or perhaps through the troubles created by the archduke Philip, Ferdinand had been estranged from his grandson Charles, afterward emperor under the title of Charles V.; and he thought of depriving him of part at least of his inheritance. He had consequently married in 1505 Germaine de Foix, a niece of Louis XII. of France; but the child he had by her died, and he was thus disappointed in his hopes. In 1518 he took a philtre for the purpose of restoring his exhausted vigor; but the potion produced a lingering illness which ended in death. Ferdinand was the founder of the greatness of Spain; he consolidated the whole peninsula, with the exception of Portugal, into a single political body; gained for the crown a power which it had never possessed before; extended its influence beyond the peninsula, and gave it weight in the general affairs of Europe. To reach the aim of his ambition he was far from being over scrupulous in his means; a crafty politician and avaricious in every respect, he did not hesitate to break his word, or even his oath, when interest or bigotry commanded. But notwithstanding his perfidy and treachery, his memory has been held in great reverence in Spain; and the severity shown toward him by some historians cannot prevent posterity from regarding him as one of the ablest princes of his age. A just appreciation of his life and times may be found in Prescott's "History of Ferdinand and Isabella." (See ISABELLA.)

FERDINAND VI., surnamed the Wise, king of Spain, born Sept. 23, 1713, died Aug. 10, 1759. He was the son of Philip V. and Louisa Maria of Savoy, and ascended the throne in 1746. His government was one of justice, prudence, and peace. He encouraged manufactures, arts, and literature. He was one of the signers of the treaty of Aix-la-Chapelle (1748). He was succeeded by his half brother Charles III.

FERDINAND VII., king of Spain, born in San Ildefonso, Oct. 13, 1784, died in Madrid, Sept. 29, 1833. He was the eldest son of Charles IV. and Louisa Maria of Parma. In 1789 he was declared prince of Asturias and heir apparent to the crown. Under the influence of his preceptor, the canon Escoiquiz, he early felt a strong aversion to Godoy, prince of the peace, the favorite of both his parents. This was aggravated by Maria Antonietta of Naples, whom he married in 1802, and kindled into hatred in 1806 upon the sudden death of his wife, whom he asserted without sufficient proofs to have been poisoned. Henceforth two hostile factions openly divided the court: that of Godoy, supported by the king and queen, and that of the prince of Asturias, comprising the great majority of the nation, who shared in his hatred of the favorite. The dissensions between the son and the father, who was but a tool in the hands of his queen and Godoy, grew into scandalous quarrels. The crown prince, at the instigation of Escoiquiz and others, addressed a letter to Napoleon, complaining of Godoy's

conduct, and proposing to place himself under his protection, and to marry a member of his family. He also copied a memorial to the king against Godoy, which he was to have read to him in person; but Charles had him arrested and kept in close confinement. A royal proclamation issued Oct. 30, 1807, denounced Ferdinand as having laid a plot against the power and even the life of his father. In a vague but humble letter, Ferdinand confessed that he had sinned against his father and king, implored forgiveness, and was publicly pardoned. These transactions were soon followed by more serious events. The royal family, who acted under the advice of Godoy, having attempted to leave Aranjuez with the ultimate view of embarking for America, a sedition broke out, March 18, 1808; the departure was prevented, and the people, infuriated against Godoy, stormed his palace, seized, wounded, and would have murdered him, had not the prince of Asturias, moved by the tears of his mother, used his influence over the crowd to save his life. The king was so much frightened that he abdicated the next day in favor of his son. Two days later he attempted a retraction, maintaining that his abdication had been forced; but the prince, who had been active in all these transactions, assumed the title of king, and made his solemn entry into Madrid, March 24. The peninsula was already invaded by French troops, and Murat soon marched into the capital. Ferdinand hoped to conciliate Napoleon by submission; he went as far as Bayonnette to meet him; here, notwithstanding the empty honors which were paid to him, he found himself a prisoner, and was made to understand that he must restore the crown to his father. The old king, his queen, her favorite, and the infantes had also been brought to Bayonne; and yielding to a pressure which he was unable to resist, Ferdinand assented to the surrender of his royal title. But this title, and all the rights it conferred, had already been resigned (May 5) by Charles into the hands of Napoleon. The emperor declared that "the house of Bourbon had ceased to reign in Spain," and placed his brother Joseph on the vacant throne. Ferdinand was immediately transferred to the castle of Valençay, where he remained nearly six years. At length Napoleon, in the hope of diverting Spain, which Joseph had lost, from the coalition against him, liberated his captive; by the treaty of Dec. 11, 1813, he restored to him the Spanish crown, on condition that he would make the English evacuate the peninsula, secure a large income to his parents, and keep in their offices and immunities all the Spaniards who had been in the service of King Joseph. On March 10, 1814, Ferdinand left Valençay; and on his arrival in Spain he was welcomed by popular acclamations. He did not abide by the terms of the treaty with Napoleon, but expelled at once the *afancesados* (supporters of the French government), annulled the pro-

ceedings of the cortes, and abolished the constitution. All the members of the cortes or the regencies who had participated in the framing of the constitution of 1812, or had faithfully adhered to it, were arraigned before courts martial, tried, and sentenced. A number perished on the scaffold; hundreds of the most illustrious were sent to dungeons in Africa or imprisoned at home; the most fortunate were exiled. For six years Spain was given up to the unrelenting cruelty of a revengeful tyrant, whose gross personal appearance and habits but added to the disgust of the people. At last discontent ripened into insurrection, the signal for which was given by the army. Troops assembled at the Isla de Leon to sail for South America revolted under Col. Riego, Jan. 1, 1820, and proclaimed the constitution of 1812, and the whole army followed their example. Ferdinand convoked the cortes and swore (March 9) faithfully to observe the instrument he had formerly annulled. Under the influence of a provisional junta who assumed the direction of affairs, he abolished the inquisition, banished the Jesuits, and reestablished the freedom of the press. On the opening of the cortes, July 9, he renewed his oath to the constitution, and appeared to act in perfect accord with that assembly, while at the same time he was intriguing to defeat the plans of his own cabinet and to encourage the plots of the opposite party. This double dealing soon brought about bloody riots and finally civil war in the capital and nearly all the provinces. The liberals or constitutionalists, who formed a large majority of the nation, were strenuously opposed by the serviles or ultra royalists. The latter, pretending that the king was a prisoner in the hands of the cortes, organized an apostolic junta, and raised bands of insurgents in Navarre and Catalonia, under the name of "army of the faith." Monks and friars, among whom Merino was conspicuous, were at the head of these bands. At Madrid, the royal guards, secretly incited by their own master, attempted in July, 1822, to reestablish by force his absolute power; but after a violent struggle they were put down. Henceforth the constitutionalists held Ferdinand in a kind of imprisonment scarcely disguised under court ceremonial. A liberal ministry was appointed; energetic measures were resorted to; the "army of the faith" was totally defeated; its chiefs and soldiers, as well as the ultra-royalist committee known as the regency of Urgel, fled to France. The revolution was thus triumphant; but the "holy alliance" were preparing for its overthrow. France, which had assembled an army of observation near the Pyrenees, received orders from the congress of Verona to march into Spain for the purpose of restoring Ferdinand's authority. On the news of the threatened invasion, the king was removed to Seville, March 20, 1823; and on the rapid advance of the French under the command of the duke d'Angoulême through the peninsula, he was declared

to be insane, suspended from his power, superseded by a regency, and taken to Cadiz, where the constitutionalists intended to make a stand. But this project was baffled by the French army, which stormed the Trocadero, Aug. 31. The cortes then decided on declaring King Ferdinand reestablished; and the monarch at once published (Sept. 30) a proclamation granting a general amnesty, and securing the engagements entered into by the constitutional government. But having left Cadiz the next day, he revoked the proclamation and all his acts since March 7, 1820. He made his solemn entrance into Madrid, with the applause of the ultra royalists, Nov. 18, and the work of vengeance commenced, and was continued for years. The noblest victims fell under the sword of the executioner, and terror reigned throughout Spain. Ferdinand did not even evince the least forbearance toward those who had served him most faithfully, but used his power against his friends as well as his foes. The most important Spanish colonies in America gained their independence during his reign. He had already been married three times and had no children, and took as his fourth wife, Dec. 11, 1829, Maria Christina, daughter of King Francis of Naples. This queen, much younger than her husband, gave him two daughters, and procured from him the publication of a decree abrogating the Salic law. This excited the anger of the partisans of Don Carlos, the king's brother; and insurrectionary movements broke out in the provinces, while intrigues were set on foot at the court for the recall of the decree. During a temporary illness the king was prevailed upon to abrogate it; but Christina, resuming her sway over her husband's mind, had it confirmed, and received herself the title of regent, while Carlos and many of his adherents were ordered out of the kingdom. This rekindled civil war, which broke out with great violence soon after the death of Ferdinand. His daughter Isabella, a child of three years, inherited the crown; but it was not secured to her till after a protracted and bloody contest.

IV. TUSCANY.

FERDINAND III., grand duke of Tuscany and archduke of Austria, born in Florence, May 6, 1769, died there, June 18, 1824. He came into possession of Tuscany in 1790, when his father Leopold II. was called to the imperial throne of Germany. The French invaded his dominions in 1796, under Bonaparte, and conquered them in 1799. Ferdinand became dispossessed by the treaty of Lunéville in 1801, but in 1803 obtained as indemnity the archbishopric of Salzburg, with the title of elector of the empire. This electorate he exchanged in 1805 for Würzburg, and in 1806 was admitted into the confederation of the Rhine. After Napoleon's abdication in 1814 Ferdinand was restored to the grand duchy of Tuscany, but was again obliged to abandon his capital

for a short time in 1815, when Murat proclaimed the independence of Italy. The battle of Waterloo restored him.

FERDINAND IV., grand duke of Tuscany and archduke of Austria, grandson of the preceding, born June 10, 1835. He married Anna Maria, daughter of the king of Saxony, in 1856, and began to reign in 1859, after the abdication of his father Leopold II.; but a few months later the Tuscan constituent assembly declared in favor of annexation to Sardinia, which was consummated March 22, 1860, and which involved the forfeiture of the grand-ducal crown of Tuscany.

FERDINAND (Augustus Francis Anthony), titular king of Portugal, born Oct. 29, 1816. He is a son of Prince Ferdinand of Saxe-Coburg-Gotha. In 1836 he became the second husband of Queen Maria II. of Portugal, and the title of king was conferred on him, Sept. 16, 1837. After the death of the queen (Nov. 15, 1853) he was regent during the minority of his son, the late Pedro V., which ended Sept. 16, 1855. In 1870 he declined the Spanish crown offered to him by Prim and Serrano. He excels as a painter and engraver, and possesses many other accomplishments. He married on June 10, 1869, Eliza Hensler, born in Boston, Mass., in 1840. She is the daughter of a German shoemaker. Possessing remarkable beauty of person and voice, she was educated for the opera, and first appeared in New York in her 16th year. She afterward studied in Paris, sang at the Grand Opéra with little success, and went to Lisbon, where she became a favorite. Ferdinand procured for her the title of countess of Edla previous to marrying her.

FERENTINO (anc. *Ferentinum*), a town of Italy, in the province and 40 m. S. E. of the city of Rome; pop. about 8,000. It is situated nearly 1,600 ft. above the sea, and is surrounded by ancient walls built of hewn stone without mortar. The cathedral is paved with ancient marbles and mosaics. Ferentino is celebrated for its splendid view over the Volscian mountains, for its mineral springs, and for its antiquities. Besides large portions of the walls built in the Cyclopean style of large irregular and polygonal blocks, there are many other interesting remains of Roman structures and numerous inscriptions. The ancient Ferentinum seems, judging from the remains, to have been an important place, although little mention is made of it in history beyond the fact that Hannibal devastated it in 211 B. C. Horace alludes to Ferentinum as a remote country town, but he is supposed to refer to another place of the same name in Tuscany.

FERGUSON, Adam, a Scottish philosopher and historian, born at Logierait, Perthshire, in 1724, died in St. Andrews, Feb. 22, 1816. He was educated in Perth and in the university of St. Andrews, and studied theology in Edinburgh, where he became associated with Robertson, Blair, and Home. In 1745, though he had stu-

died but half the required term, he was ordained, in consequence of having been selected for his knowledge of the Gaelic language to act as chaplain of one of the highland regiments, which he accompanied to Flanders. He remained in this situation till 1757, when he became conspicuous by his defence of the morality of stage plays, written upon occasion of the success of his friend Home's tragedy of "Douglas." In 1759 he was elected professor of natural philosophy in the university of Edinburgh, and in 1764 of moral philosophy. In 1778 he came to America as secretary of the commission appointed to negotiate with the revolted colonies, his place in the university being supplied during his year's absence by Dugald Stewart, who in 1785 became his successor. In his 70th year he paid a visit to the principal cities of the continent, and was elected a member of several learned societies. The last years of his life were passed in St. Andrews, where he observed a strictly Pythagorean diet. His "History of the Progress and Termination of the Roman Republic" (1788) is valuable for its philosophical reflections, clearness of style, and masterly portraiture of character. His "Essay on the History of Civil Society" (1767) discusses the origin, end, and form of government, affirms the natural sociability of men, in opposition to the hypothesis of Hobbes of their natural hostility, and defends civilization against the charges of Rousseau. His philosophical views are contained in his "Institutes of Moral Philosophy" (1769), and in his "Principles of Moral and Political Science" (1792). He belongs by his general method to the school of Bacon, recommending everywhere experience and the study of facts as the condition of successful research.

FERGUSON, James, a Scottish experimental philosopher and astronomer, born near Keith, Banffshire, in 1710, died in London, Nov. 16, 1776. His father, a day laborer, taught him to read and write, which was the only education he was able to bestow on his children. When seven or eight years of age his attention was attracted to mechanics by observing his father raise a heavy weight with a lever. He investigated the principle and made several machines combining the lever and the pulley, which he described in a treatise with drawings. On showing this to a gentleman, he was surprised to find that those things had been treated of before, but was equally pleased that he had discovered the true principle. While tending sheep he made models of mills, spinning wheels, and other machines, acquired the rudiments of astronomy, taught himself to draw, made maps, and learned the principles of geography. By the aid of patrons he afterward studied portrait painting in Edinburgh, and next medicine, but finally devoted himself to astronomy. In 1748 he removed to London, where he attracted attention by a publication of astronomical tables. In 1747 he published "A Dissertation on the Phenomena of the

Harvest Moon," and afterward lectured in many places on experimental philosophy and astronomy. George III. settled on him a pension of £50. His latter years were mostly devoted to the delivery of his lectures, which had become very popular. The most important of his works are: "Astronomy Explained on Sir Isaac Newton's Principles" (4to, London, 1756); "Lectures on Mechanics," &c. (8vo, 1764); "An Easy Introduction to Astronomy" (1769); "An Introduction to Electricity" (1770); and "Art of Drawing in Perspective" (1775). Sir David Brewster published corrected editions of his "Lectures" and "Astronomy" in 1805 and 1811.

FERGUSON, Robert, an English physician, born in India in 1799, died June 25, 1865. He studied medicine at the universities of Heidelberg and Edinburgh, took the degree of M. D. in 1825, and settled in London, where he rapidly acquired a large and lucrative practice. He became physician to the general lying-in hospital, professor of midwifery at King's college, and physician-accoucheur to King's college hospital. He was also physician extraordinary to the queen, whom he attended in all her confinements. His chief publications are an "Essay on Puerperal Fever" and an edition of Gooch's works.

FERGUSON, James, a British writer on architecture, born at Ayr, Scotland, in 1808. He was educated at the high school of Edinburgh, and after several years' experience in a counting house in Holland and England, went in 1829 to India, where for ten years he was engaged in mercantile pursuits. Returning to England, he devoted himself to art and literature. During his residence in India he had taken great interest in the ancient architectural remains, and among the fruits of his observations was a description of the rock-cut temples with illustrations by himself (1845), and "Picturesque Illustrations of Ancient Architecture in Hindostan" (1847-'8). In 1847 he published "Ancient Topography of Jerusalem," in which he undertook to show that the building known as the mosque of Omar is the church of the Holy Sepulchre. In 1849 appeared the first volume of his "Historical Inquiry into the True Principles of Beauty in Art, more especially with reference to Architecture," which was succeeded by the "Illustrated Handbook of Architecture" (1855), in the preparation of which he used the materials already collected for the succeeding volumes of the former work. In these works he gives a complete survey of the architectural monuments of the chief nations of ancient and modern times, and offers many suggestions of great practical value. His "Palaces of Nineveh and Persepolis Restored" (1851), published while Mr. Layard's excavations were proceeding, exhibits a profound knowledge of the architecture of the Assyrians and Persians; and upon the subsequent establishment of the crystal palace at Sydenham,

of which he was the general manager for some time after its opening, he personally superintended the arrangement of the Nineveh court. His attention had been drawn in India to the use and application of earthworks in modern fortifications, and he proposed the substitution of circular forms for angles and bastions, and of earthworks for masonry. On this subject he published "The Peril of Portsmouth" and "Portsmouth Protected," and "Essay on a proposed New System of Fortification" (1849). His system was put in practice in the Russian defence of Sebastopol, and frequently employed in the civil war in the United States. In 1859 he became one of the royal commissioners for the defences of the United Kingdom. In 1871 he received the royal gold medal of the institute of British architects. Besides the works mentioned, he has published "A History of Architecture in all Countries," a reconstruction of his "Handbook" (3 vols., 1862-'7), "Rude Stone Monuments of all Ages" (1872), and "Tree and Serpent Worship" (new ed., 1874).

FERGUSON, Sir William, a Scottish surgeon, born at Prestonpans, March 20, 1808, died Feb. 10, 1877. He early became confidential assistant to the celebrated anatomists Dr. Knox and John Turner, and in 1828 licentiate of the college of surgeons. He began to lecture on surgery in 1831, and in 1840 was called to London as professor of surgery in King's college. He was surgeon in ordinary to the prince consort Albert, and was created a baronet in 1865. He was elected president of the royal college of surgeons July 11, 1870. Besides special papers on cleft palate, lithotomy, lithotritry, aneurism, and others, he published "A System of Practical Surgery" (London, 1848), and "Progress of Anatomy and Surgery in the 19th Century" (1867). He was also the inventor of numerous surgical instruments.

FERISHTAH, Mohammed Kasim, a Persian historian, born in Astrabad about 1560, died probably about 1611. His father left his native country to travel in India, where he settled in the Deccan as instructor to the son of one of the reigning princes. The young Ferishtah was advanced to honors at court, but subsequently, induced by civil commotions and changes of government, repaired to the court of Ibrahim Adil Shah in Bejapore, where he passed the remainder of his life, and wrote his history of India. This work, which was first published in 1606, is one of the most authoritative oriental histories; it contains all the facts which the author deemed worthy to extract from more than 80 older histories, and is still in India the most popular history of the country. The introduction gives a brief account of India prior to the Mohammedan conquest, and then follows in 12 books a history of the kings of the different provinces, and of the European settlers. At the conclusion there is a short account of the geography, climate, and other physical circumstances of the country. It was several times partially translated into

English, and the whole work, with the exception of some passages which have been since discovered, was published in London in 1829 by Col. John Briggs, under the title of "The History of the Rise and Progress of the Mohammedan Power in India, from its commencement in 1000 to 1620." Col. Briggs also published an edition in Persian at Bombay, in 1831.

FERLAND, Jean Baptiste Antoine, a Canadian historian, born in Montreal, Dec. 25, 1805, died in Quebec, Jan. 8, 1864. He was ordained priest in 1828, and afterward appointed professor of history in Laval university. He published a review of Brasseur de Bourbourg's "History of Canada;" "Notes on the first Register of Quebec;" "Journal of a Voyage on the Coast of Gaspésie;" "Labrador;" and a "Life of Bishop Plessis." At the time of his death he was engaged on a "Course of Canadian History;" the first volume had appeared, and the second was in the press.

FERMANAGH, an inland county of Ireland, province of Ulster, bordering on the counties Donegal, Tyrone, Monaghan, Cavan, and Leitrim; area, 714 sq. m.; pop. in 1871, 92,688. It lies almost wholly in the basin of Lough Erne, which divides it lengthwise into two nearly equal portions. Its S. W. part is mountainous, and the N. E. part rises into steep hills. The soil is as varied as the surface, but except a wide belt in the south is not remarkably fertile. The productions are oats, barley, wheat, flax, potatoes, turnips, and hay. Cattle are bred on the high grounds, and butter, eggs, &c., are exported. Limestone, marl, potter's clay, and small quantities of coal and iron, are the chief mineral products. Timber is more abundant than in most Irish counties, but is grown principally on the large estates, many parts of the county having a desolate appearance. There are no important manufactures, and few large towns; those worthy of notice are Enniskillen, Lisnaskea, and Lowtherstown.

FERMAT, Pierre de, a French mathematician, born in southern France in August, 1601, died in Toulouse, Jan. 12, 1665. He studied law, and became in 1631 councillor at the parliament of Toulouse, devoting his leisure to mathematical studies. D'Alembert, Lagrange, and other French authorities claim for him the honor of having been the principal inventor of the differential calculus; and Laplace states that it was due to Fermat and his collaborer, Pascal. His theories are chiefly contained in his treatise *De Maximis et Minimis*, republished in 1679 with his miscellaneous scientific writings. Descartes combated his propositions concerning the calculus, and Fermat opposed Descartes's views in respect to geometry and optics.

FERMENTATION (Lat. *fermentum*, leaven, a contraction of *fermentum*, from *fervere*, to boil), the conversion of an organic substance into one or more new compounds, under the influence of a body which is called a ferment. It is a process which with more or less skill has been employed from the earliest times in

the manufacture of alcoholic beverages, but its philosophy has been but imperfectly understood until recent times, and several questions still remain involved in doubt, and are matters of warm controversy. Formerly chemists recognized four kinds of fermentation, the vinous, the panary, the acetous, and the putrefactive; but now the panary is included in the vinous, while other kinds have been added, the number not being definitely settled. The following list may be given as the one usually recognized, although it will be seen that some of them are probably parts of the processes of others: 1, saccharine; 2, alcoholic or vinous; 3, acetic; 4, lactic; 5, butyric; 6, mucous or viscous; 7, putrefactive. To these there might be added without impropriety the benzoic, in which the amygdaline of the bitter almond, under the influence of emulsine, forms prussic acid and other bodies; and the sinapic, in which oil of mustard is produced during fermentation of the flour of black mustard. The act of digestion may also not improperly be regarded as a species of fermentation, because it involves, under the influence of minute organic cells, furnished by the mucous coat of the stomach, a transformation of proteine compounds into albuminose, which is just as truly a change by the influence of a ferment as the formation of lactic acid from lactic sugar, or of glucose from dextrine.—1. *Saccharine Fermentation*. In the article *Brewing* is described the process for the malting of barley, in which the production of diastase from albuminous matter accompanies the evolution of the grain into plumula and radicle. This diastase is the ferment of saccharine fermentation, by whose influence the starch of the grain is converted into sugar; the steps in the process being, first, the formation of soluble starch, then dextrine or gum, which next passes into glucose or grape sugar. Starch, soluble starch, and dextrine have the same chemical constitution, or more strictly speaking have the same proportion of elements, and may therefore be considered as allotropic conditions of each other. The transformation of dextrine into glucose consists in the assimilation of the elements of water, and may be represented in the following equation:



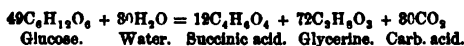
There is usually at the same time produced a small quantity of lactic acid, in consequence of a catalytic action, probably of the diastase, by which the glucose, having the same proportion of elements as lactic sugar, but differently grouped, takes on the functions of the latter substance and splits up into lactic acid. The saccharine fermentation, which takes place in malting, is promoted by the action of heat, which should commence at about 85° and terminate at about 135° F.; but in a decoction of malt, as in the mash tun of the brewer, it is conducted at a higher temperature, from 158° to 167°. The drying of the malt in kilns at this stage arrests

the conversion of the sugar into lactic acid, which is evolved in considerable quantity if the malt is allowed to cool in a moist state. The action of dilute acids, assisted by heat, also has the power of converting starch into dextrine and grape sugar. (See DEXTRINE.)

—2. *Alcoholic or Vinous Fermentation.* If a decoction of malt is allowed to stand for a time in the open air at a temperature varying from 40° to 85° F., a change takes place, in which bubbles of carbonic acid gas may be seen to rise from the mass; and upon examination it will be found that portions of the sugar and gluten have disappeared, and in their place will be found alcohol, lactic, acetic, and succinic acids, and some glycerine, in varying proportions, depending upon the temperature and the amount of saccharification that had taken place in the malt. There will also be found more or less of a viscid substance containing yeast cells and germs and other microscopic organisms, and some mannite. If, however, instead of allowing the decoction of malt to ferment spontaneously, it be kept at a temperature of 158° to 167° F. until most of the dextrine has been converted into glucose, and then filtered and cooled to 70° or 85° with sufficient rapidity to prevent the commencement of premature fermentation, and then a quantity of brewer's yeast which has been kept in a warm place until it begins to decay be stirred in the mass, brisk fermentation will soon be induced, by which nearly all the glucose will be transformed into alcohol and carbonic acid, as represented in the following equation:



Under the most favorable circumstances not more than 95 per cent. of the sugar passes into alcohol and carbonic acid, the remainder being converted into succinic acid and glycerine. Both these bodies are formed, according to Pasteur, as follows:



The production of succinic acid in alcoholic fermentation was discovered by C. Schmidt in 1847. Pasteur discovered a few years ago that glycerine was also one of the products. Amylic alcohol or fusel oil is also frequently produced in alcoholic fermentation. Cane sugar, $\text{C}_{12}\text{H}_{22}\text{O}_{11}$, does not pass into alcohol and carbonic acid directly, but is first converted into glucose by assimilating one equivalent of water, thus:



It then passes into alcohol and carbonic acid as before represented. Milk sugar, $\text{C}_{12}\text{H}_{22}\text{O}_{11}$, which has the same proportion of elements as grape sugar, but with a different molecular arrangement, is also transformed into alcohol and carbonic acid under the influence of cheese or other proteine bodies in a state of decay; first

passing, according to some observers, into glucose. Must of grape or juice of fruit, if boiled and suspended in a bladder in the midst of fermenting must or wort, will not ferment; and it has been stated that if yeast cells be prevented from coming in contact with the fermentable liquid, fermentation will not take place, although the soluble contents of the cells may pass through the membrane. Should this statement be substantiated by further observation, it would go to show that the exceedingly minute germs of yeast cannot penetrate through the coats of animal membranes, although so small as to be scarcely visible under a magnifying power of 2,800 diameters, and would also show that fermentation, whatever may be the question as to its being itself a vital process or a chemical one, cannot take place without the influence of these vitalized germs.

Yeast, *torula cerevisia* or *mycoderma vini*, is a fungoid vegetable organism, composed of microscopic globules which attain a maximum diameter of about $\frac{1}{1000}$ of an inch. Each globule is composed of a thin membranous cell wall having the composition of cellulose, $\text{C}_6\text{H}_{10}\text{O}_5$, and is filled with a gelatinous proteine compound, principally consisting of exceedingly minute germinal granules. There are two varieties of yeast, depending upon the mode of propagation. When fermentation is conducted below 45° F., the propagation is carried on by an increase of the germinal granules within the cells by assimilation of nutriment from the fermenting liquid, until the cell wall bursts and the partially organized granules which are liberated proceed in their development, forming in turn parent cells. Yeast formed in this manner is called by the German brewers bottom yeast (*Unterhefe*), and is the kind used in the fermentation of Bavarian beer. It is deposited during the process at the bottom of the fermenting tun in the form of a grayish viscid or gelatinous mass, the yeast being more or less mixed with other sedimentary matter. When, however, the temperature at which the fermentation is conducted is much above 45°, say from 70° to 85°, the development of germinal matter becomes much more rapid, and it passes, according to Dr. Lionel Beale, through pores of the parent cell wall, perhaps carrying a thin pellicle with it, and makes its appearance upon the outside in the form of what have been called buds, first discovered by Cagniard de la Tour. (See fig. 1.) These buds, which for a time remain attached by pedicles to the parent cells, then go on developing, and in time become detached and assume the functions of parent cells; or buds may spring from them before their separation, and thus branches extending to some distance may be formed, as in fig. 2. Fig. 3 exhibits an appearance often noticed: several buds growing from one parent cell, each filled with granular matter, and presenting an irregular outline. On account of its branching structure, yeast which grows in this way becomes buoyant from the collec-

tion of bubbles of carbonic acid gas between the branches, and rises to the top of the liquid, and therefore is called top yeast (*Oberhefe*). It is the kind used in the fermentation of the wort of ale and strong spirituous liquors. It would appear, however, that the mode of propagation



FIG. 1.—Growing yeast cells and most minute germs, magnified 2,000 diameters (Beale).

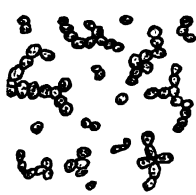


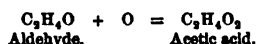
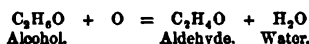
FIG. 2.—Yeast cells, growing during 48 hours, magnified 350 diameters (Beale).

does not instantly change in either variety upon a change of temperature. Thus top yeast placed in a fermentable liquid having a temperature of 45° is said not to pass into bottom yeast at once, as though a habit had been acquired; and conversely, bottom yeast will not develop as top yeast under a certain length of time. Yeast globules do not increase in number in pure sugar solutions, but the older globules waste away while the new buds grow at the expense of their contents. To effect the fermentation of 100 parts of sugar requires about one part of yeast, weighed when dry. When the proportion of sugar is greater the excess remains unaltered, the cells will be ruptured, and the solution will be found to contain a certain quantity of lactate and acetate of ammonia, and other ammoniacal salts. When, however, instead of a pure sugar solution, a saccharine vegetable infusion, as sweet wort, is employed as the fermentable liquid, the yeast cells rapidly increase at the expense of the azotized matters which are present and which are essential as their nutriment. During the fermentation of beer they often increase to eight or ten times their original quantity. The following table, according to Mitscherlich, gives the composition of yeast in its active and in its exhausted state, the amount of ash being deducted:

CONSTITUENTS.	Active cells.	Spent cells.
Carbon	47.0	47.6
Hydrogen.....	6.6	7.2
Nitrogen.....	10.0	5.0
Oxygen.....	85.8	....
Sulphur.....	0.6	....

The inorganic matter represented by the ash amounts to about 7.5 per cent. of the dried

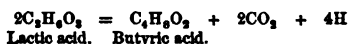
yeast, and is composed, according to Mulder, entirely of phosphates of potash, soda, lime, and magnesia.—3. *Acetic Fermentation*. Liebig regarded the conversion of alcohol into acetic acid rather as a process of *eremacausis*, or slow oxidation, by which hydrogen was removed and oxygen substituted; but as the process is facilitated by ferments, particularly by the *mycoderma aceti*, it is generally regarded as a species of fermentation. Alcohol is readily oxidized by the influence of finely divided platinum into acetic acid, and also by binoxide of manganese and bichromate of potash. It is supposed that the reaction includes two stages: first the formation of aldehyde by the abstraction of two equivalents of hydrogen, water being at the same time formed; and subsequently the addition of one equivalent of oxygen, as represented by the following equations:



If the supply of oxygen be insufficient, much of the aldehyde remains unconverted into acetic acid, and on account of its great volatility may pass away in vapor. Pure diluted alcohol does not absorb oxygen from the air, but requires the presence of some inducing body which shall modify the atomic character of the oxygen, and also perhaps of that of the alcohol, so that the affinity of the constituent hydrogen and the atmospheric oxygen shall be increased.

—4. *Lactic Fermentation*. When milk is left to stand for a time, the lactic sugar ($\text{C}_{12}\text{H}_{22}\text{O}_{12}$) which it contains decomposes into lactic acid. The transformation is exceedingly simple, consisting merely in the splitting up of the molecules of sugar into a less complex arrangement, $\text{C}_{12}\text{H}_{22}\text{O}_{12}$ becoming $2\text{C}_6\text{H}_{10}\text{O}_6$, or lactic acid. Caseine while passing into a state of decay was formerly supposed to be the ferment which induced the process; but according to Hallier and others, it consists of minute organisms which are developed from spores of *penicillium crustaceum*. (See figs. 4, 5, 6, 7.) The process is usually accompanied or immediately followed by the coagulation of the milk, an action which is generally ascribed to the abstraction of the alkaline constituents of the caseine, which are supposed to hold it in solution; but it is asserted by some observers that coagulation of new milk by rennet often commences before any lactic acid makes its appearance. Another mode of producing lactic fermentation is by the employment of glucose. When a solution of glucose is mixed with new sour cheese, or with milk and chalk, and exposed to a temperature of 75° or 80° F. for some weeks, with frequent stirring, the sugar is converted into lactic acid, which when chalk is used combines with the base, forming lactate of lime. The chalk is used for the purpose of combining with the acid, the accumu-

lation of which to a certain amount arrests the process.—5. *Butyric Fermentation*. Toward the close of lactic fermentation butyric acid makes its appearance, accompanied by the evolution of hydrogen and carbonic acid, particularly when sugar of milk and lime are employed. The formation is represented by the following equation:



—6. *Viscous or Mucous Fermentation*. When the juices of beet root and carrot are left in a warm place for a few days, they spontaneously pass into the viscous state, for which reason this has been called the viscous fermentation. During the process there is an escape of carbonic acid and hydrogen, as in the case of butyric fermentation, and the formation of mannite, gum, and lactic acid. It has been described as taking place under the influence of a peculiar ferment composed of minute spherules, which are probably a species of *penicillium*. It is doubtful whether this should be considered as a distinct species, or as an incident in lactic or butyric fermentation.—

7. *Putrefactive Fermentation*. This occurs when bodies containing nitrogenous compounds decompose spontaneously in a limited amount of air. When the decomposing substance is freely exposed to the air, and there is not too much moisture present, eremacausis or slow combustion takes place (see EREMACAUSIS); but if the access of air is much obstructed, as when the decaying body is submerged in water, a more complex reaction takes place, in which several very offensive gases are evolved, prominent among which is sulphuretted hydrogen, the gas which gives the odor of rotten eggs. Phosphuretted hydrogen, carburetted hydrogen, ammonia, free nitrogen and hydrogen gases, and acetic, lactic, butyric, and valeric acids, as well as several noxious compounds, the nature of many of which is not perfectly understood, are also formed. The putrefaction which takes place soon after the death of a person or animal generates poisonous matter of great virulence. It is, however, the opinion of Dr. Lionel Beale that the peculiar matter which is the most poisonous is engendered at about the time of death, and perhaps a few hours before. ("Disease Germs, their Nature and Origin," London, 1872.) Complete exclusion of the air prevents putrefaction. If fermentable liquids are first boiled and sealed tightly in close jars, they may be kept for an indefinite time without undergoing either vinous or putrefactive fermentation. The commencement of the process is a matter which is involved in some obscurity. A piece of wood or animal tissue undergoing eremacausis, if supplied with sufficient moisture and nearly excluded from the air, immediately begins to putrefy. Whether the ferment is the decaying matter itself, or consists of living organisms, is a question that has not been decided.

Pasteur regards putrefaction as a peculiar species of fermentation caused by animal organisms of the genus *vibrio*, of which there are six known species; and he also regards each of them as having the power of exciting a particular mode of putrefaction. If a putrescible liquid holding air in solution is sealed in a glass vessel and left to stand for a time, certain infusoria, *monas crepusculum* and *bacterium termo*, are first developed. They absorb oxygen from the air and evolve carbonic acid, and then die and fall to the bottom as a sediment. If germs of the *vibrio* are present, they become developed, and the process of putrefaction commences. These vibrions, according to Pasteur, cannot exist in a liquid which contains oxygen. If the putrescible liquid is exposed to the air, the monads and bacteria are first developed, and forming a pellicle on the surface prevent the access of oxygen to the interior. Putrefaction then commences, but the products are partially decomposed by the influence of the layer of infusoria, and receiving oxygen are converted into water, carbonic acid, and ammonia. Pasteur also regards the slow oxidation of animal and vegetable matters, such as moistened sawdust, as dependent upon the influence of the lower cryptogamic and infusorial organisms, without the presence of which he thinks dead organized matter would be subject to but little change.—There is a tendency at the present time to regard all kinds of fermentation as due to the development of living organisms, either animal or vegetable, depending principally upon the nature and condition of the fermenting liquid. According to Pasteur, it is always accompanied by an incessant interchange of molecules between the fermenting substance and the living cells which develop themselves within it. In the souring of wine, a growth of *mycoderma aceti* forms on the surface, and has the power of condensing the oxygen of the air, like that of platinum black, or of the blood globules, and conveying it to the liquid on which it rests. Pasteur also says that the germs which cause the fermentation of grape juice come from the exterior of the fruit. He finds with the microscope organized corpuscles attached to the grape skins, which he regards as germs of the ferment. He moreover holds that alcoholic fermentation may be conducted without the presence of atmospheric oxygen, and in an atmosphere composed entirely of carbonic acid; in accordance with which idea he has invented and patented apparatus for brewing, by which atmospheric air is excluded during fermentation, one great advantage of which he claims is that the germs of other ferments which produce lactic, acetic, and butyric acids are excluded, and beer yeast or true alcoholic ferment alone allowed to act, by which a greater percentage and also better quality of product is obtained, and in a more economical way. Experiments have been made by Pasteur and others in which boiled must and other fermentable liquids have been sub-

jected to the action of filtered and heated air and oxygen without the production of fermentation; and they have also introduced the pulp of fruits into boiled must, with the same result when it was excluded from the presence of unfiltered air. Fermentation has also been carried on in tubes having their ends closed by thin membranes, and placed in fermentable liquids, but without exciting in the latter any fermentation except when natural air was admitted, which, it is contended, always carries the germs of ferments. M. Frémy maintains that certain experiments which he has made controvert the position of the upholders of the physiological theory. At a session of the French academy of sciences held in October, 1872, a discussion of the subject took place between M. Pasteur and M. Frémy, in which the latter contended that the influence of atmospheric dust in the phenomena of fermentation is only secondary and accidental, and that the true origin of ferments is in the mass of the fermentable substance. Frémy is disposed to believe that Pasteur did not establish fermentation in the boiled must in which he had placed grape juice, because he placed it in other conditions, besides those of exclusion of air, in which alcoholic fermentation could not take place. He recounted some experiments which he had made, among which was the following: He squeezed the pulp of some pears and other fruits, but without breaking the skins, and placing them in favorable situations, found at the end of several days that they contained notable quantities of alcohol; fermentation having been produced in the interior of the fruit where, in his opinion, the dust of the air could not exert any influence. Frémy therefore believes that the parenchyma of fruits contains the material which is capable of taking on conditions by which it may form ferments. He contends that there is a great number of ferments that are neither organized nor living, which are capable of producing various kinds of fermentation, depending upon the conditions in which the fermentable matter is placed. Liebig compares the action of a ferment to that of heat, by which the atomic constituents of organic molecules are shaken asunder and left to recombine under the influence of forces that may be present. Acetic acid is separated by heat into carbonic acid and acetone; just as sugar is separated by yeast into carbonic acid and alcohol. He regards vital action and chemical action as phenomena which must be considered separately in seeking an explanation of fermentation, and holds that the fact that yeast causes fermentation in a pure solution of sugar is opposed to the idea that the decomposition of sugar is caused by the development and increase of yeast cells; for yeast consists chiefly of a substance containing nitrogen and sulphur, besides phosphates, and these cannot be furnished by the sugar; and moreover, beer yeast causes a similar decomposition of other substances, malate of lime being con-

verted into carbonic acid, acetate, carbonate, and succinate of lime. Salicine is also decomposed by yeast into saligenine and salicylic acid; "and a similar decomposition of salicine is produced by emulsine without any recognizable physiological process being concerned in the change. Emulsine acts upon amygdaline in like manner, its effects being recognizable in a few minutes by the new products. Emulsion of sweet almonds also undergoes active vinous fermentation when mixed with grape sugar. But if substances containing sulphur and nitrogen, like emulsine, are, by reason of alteration in the arrangement of their atoms, capable of inducing change in other organic molecules, so that they separate into new products, there is reason for suspecting that in the action which yeast exerts upon sugar its sulphuretted and nitrogenous constituent plays a similar part." On the other hand, the experiments of Hallier are more in support of the views of Pasteur. According to this observer, the same germinal molecules develop, according to the nature of the fermentable substances in which they are deposited, into the fungoid forms peculiar to each fermentation. The forms which induce putrefaction, fermentation, and mildew are all varieties of one another. When they are developed within the fluids they are cellular formations, but when they grow upon the surface they produce fructification. Hallier agrees with Pasteur's view that the germs are all carried by the air. The following, condensed from the "Quarterly Journal of Science," is a brief summary of Hallier's views. The most abundant source of germs appears to be the *penicillium crustaceum* (fig. 4), whose spores are universally spread because it is more hardy, more fertile, and develops at lower temperatures than others of its kind. A spore of *penicillium* falling into a watery fluid bursts into a multitude of particles, each of which may be the radicle of a living fungus. The minute particles unite in twos, forming a double cell, and divide with great rapidity. (See fig. 5.) The minute particles then unite in chains, constituting *leptothrix*, which is not a species, but a form of vegetation common to many species. In pure water development can go no further, and after a few



FIG. 4.—Fructification of *Penicillium crustaceum* (Hallier).

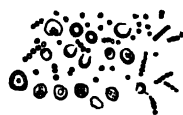


FIG. 5.—Spores of *Penicillium crustaceum* bursting in water and setting free their contained particles, *micrococci*, which unite in rows or chains (Hallier).

hours the organisms cease to be formed, the presence of a nitrogenous substance being necessary for further development. The minute spherules, *micrococci*, are the special ferment of putrefaction. In the presence of sugar the spherule enlarges and becomes a nucleated cell,

cryptococcus, which is identical with the yeast cell. (See fig. 6.) In milk, during lacteous fermentation, the *micrococcus* elongates and forms jointed staff-like cells, as in fig. 7, *arthrococcus*; and in acetic fermentation the cells become lancet-shaped. According to these views, alcoholic



FIG. 6.—*Cryptococcus* in various grades of development from *Penicillium* (Haller).



FIG. 7.—*Arthrococcus*, found in sour milk (Haller).

and putrefactive fermentations are both due to the influence of a single agent, transported from place to place in the air, which everywhere contains germinal matter, protoplasm, bioplasm, or whatever it may be called; the living molecules growing wherever they find a suitable soil, and in different soils developing into different forms, producing by their vital acts different effects. The microscopic investigations of Dr. Beale upon the development of the yeast plant show that the cells vary in size more than is usually represented, and that the development of buds is greater, the larger cells having as many as ten or more buds. (See figs. 1 and 8.) He says: "The different germinal matter within the yeast cell is the material upon which alone all growth and action depends. Were it not for the bioplasm or germinal matter, the cell would be lifeless and passive, incapable of exciting fermentation or any change whatever; and it may under favorable circumstances undergo development into complete yeast cells, so that by the artificial division of one thousand may result. And if the soft, bioplasmic matter which can be expressed from the yeast cell be placed under favorable conditions, every particle of it may germinate. This matter alone furnishes the germs, it alone grows and appropriates the nutrient material; in short, it alone manifests the phenomena peculiar to living things. The little buds or gemmules above referred to, detached from the parent mass, and capable of independent existence, are, many of them, much less than $\frac{1}{1000}$ of an inch in diameter; but each is living, and will grow under favorable circumstances into a body like the parent cell, giving origin in its turn to countless descendants. These very minute particles divide and subdivide independently, producing still more minute particles, capable of growth and division like themselves; . . . and this mode of multiplication may go on for a long period, perhaps for an indefinite time, if certain conditions persist. But if any one of these excee-

sively minute particles falls into a medium containing suitable pabulum, it will appropriate it and soon pass on to a higher stage of development. In this case branches may be formed, and from them may proceed stems which grow upward into the air, and bear upon their summits heads in which spores are found, these last being so well protected from the influence of destructive agents that the germinal matter within can retain its vitality for a great length of time. The spores just referred to are so light as to be easily supported in the atmosphere, and they may be carried a long distance by currents of air." Béchamp has made an investigation into the action of chalk which is used in lactic and butyric fermentation. As has been stated, the chalk is added for the purpose of preventing an accumulation of acid in the solution; and although this is an important action, Béchamp has shown that chalk is itself capable of establishing alcoholic, lactic, and butyric fermentations. The chalk formation consists principally of the remains of minute organisms; but independently of these fossils, he finds that chalk contains living organisms of extreme minuteness, which he has named *microzyma creta*, and regards as the most powerful ferments known. A sample of native chalk, taken from the centre of a large block and mixed with water, reveals under the microscope numerous bright points having very lively trepidating movements, which are the organisms in question. The following experiment shows their power of inducing fermentation: There were intimately mixed 420 grms. of starch paste, 80 grms. of chalk, and 4 drops of creosote. At the same time a similar mixture was made, except that pure carbonate of lime was used in place of chalk. In three days the starch in the mixture containing chalk was liquefied, but no change was produced in the one containing pure carbonate of lime. On Nov. 14, 1864, 100 grms. of starch, 1,500 cc. of water, and 10 drops of creosote were mixed with 100 grms. of chalk. On March 30, 1866, the mixture was analyzed and found to contain 4 cc. of absolute alcohol, 8 grms. of butyric acid, and 5.2 grms. of crystallized acetate of soda. On April 25, 1865, 80 grms. of cane sugar, 1,400 grms. of chalk were mixed with 1,500 cc. of water containing creosote, and when examined on June 14 following yielded 3.6 cc. of absolute alcohol, 4.5 grms. of butyric acid, 6.8 grms. of acetate of soda, and 9 grms. of lactate of lime. When proper precautions are taken no other ferment is found in the liquid after fermentation besides those contained in the chalk, and which have become considerably augmented.—Fermentation is retarded or arrested by the action of various substances. An accumulation of about 15 per cent. of alcohol in the process arrests it. Lactic fermentation is also arrested when a certain quantity of lactic acid accumulates. Sulphurous acid, even in small quan-

ties, has a remarkable effect in arresting fermentation, especially the acetic, and sulphite of calcium is extensively used by manufacturers of cider and wine, and judiciously employed does not injure the beverage. Sulphurous acid is coming into use in distilleries in the process of mashing, with a view to prolong it so that an increased amount of dextrine and fecula may be converted into glucose before fermentation commences. The mineral acids generally, chlorine, chloroform, camphor, carbolic and formic acids, and creosote, as well as most mineral salts, also turpentine and essential oils, have in varying degrees the property of arresting or preventing fermentation. The employment of common salt to prevent putrefactive fermentation is a familiar example of antiseptic action. According to Dumas, alcoholic fermentation is not affected by earthy carbonates and neutral salts of potash and lime, and it is accelerated by a solution of bitartrate of potash, the yeast cells becoming more perfect, and filled with plastic matter containing numerous germs and mobile corpuscles.—From all the researches which have been made into the subject of fermentation, whether the ferment be considered merely as an organic body in a state of change, or as a living organism, the explanation of the process is assisted by a consideration of the vibratory theory of molecular physics. When two or more bodies are brought into intimate contact with each other, as where a ferment is suspended or stirred in a fermentable liquid, so that the molecules are intermingled, a tendency to produce a change of vibratory motion in them must follow as a necessary consequence; and this tendency is much modified by the addition or abstraction of heat. The difficulty of ascertaining experimentally whether any of the minute germs, which require the highest powers of the microscope yet attained to enable them to be seen, may be present in a liquid, places the question as to the ultimate cause of fermentation in doubt, and it seems that the nearest approach to a solution of it must thus far depend upon logical inferences. Bucholz found that no fungi could be detected in milk mixed with a small quantity of carbolic acid, but that nevertheless it slowly turned sour. He therefore inferred that lactic fermentation is not due to the action of living organisms, but to a chemical ferment contained or formed in the milk. But although he found no fungi, minute organic germs may have been present, undiscoverable by the microscopic power which he employed. Béchamp, before making the experiments with chalk described above, had also found that creosote in certain quantities prevented the development of spores of fungi and germs of infusoria, without interfering with the action of ferments. The influence which may be exerted by undeveloped germs under similar circumstances is a matter difficult to determine. There is a suggestion contained in the results of experiments which have been made by Pas-

teur and others with boiled fermented liquors. It is asserted that they may be preserved for an indefinite time if filtered air or pure oxygen only is admitted into the vessel. Now, Payen found that certain organic spores did not lose the power of germination till heated to 284° F.; and others maintain that organic germs will retain their vitality at much higher temperatures than this. It is certain that the decomposition of the proteine body is arrested by boiling, so that its influence is destroyed; but it is quite probable that germs which have hitherto escaped detection by means of the microscope may yet remain alive. If, therefore, it be a fact that boiling will for an indefinite time preserve a fermentable liquor when natural air is excluded, this would seem to indicate that something more than the presence of organic germs is necessary to induce fermentation, such as proteine compounds in a certain state of change, the peculiar action of which, however, may be advantageously manifested in the presence of yeast or some living organism. The facts also that brewers find in their practice that yeast does not exert its powers advantageously unless, before being added to the fermenting tun, it be kept in a warm place till incipient putrefaction takes place, and that washed yeast when added to wort does not produce fermentation until a certain time has elapsed, strengthen the opinion. The fact, however, that, although undecomposed proteine compounds may be contained in the boiled liquor, they will not begin to decay in the presence of filtered air or pure oxygen, but require the admission of natural air, would indicate that they also require the presence of some body having a chemical or catalytic force not possessed by pure oxygen, which is removed from the atmosphere by filtration.

FERMO (anc. *Firmum Picenum*), a town of Italy, in the province of Ascoli, 82 m. S. E. of Ancona, and 3 m. from the Adriatic; pop. about 20,000. It is the seat of an archbishop, has a cathedral and seven other churches, a lyceum, a communal gymnasium, a public library, and a theatre. It exports corn, silk, and woollens. It was founded by the Sabines before Rome existed, and became in 264 B. C. a Roman colony. From the 8th century it generally belonged to the papal dominions till 1860, when it became part of the kingdom of Italy. It is the birthplace of Lactantius.

FERMOY, a town of Ireland, in the county and 19 m. N. E. of the city of Cork, on both sides of the Blackwater, which is here spanned by a fine stone bridge, built in 1866; pop. in 1871, 7,611. At the beginning of the present century there were here only a few cabins, until Mr. John Anderson, the owner of the estate, built a hotel, and erected for the government barracks sufficient for 3,000 men. Fermoy thus became the central military station of Ireland. Mr. Anderson also laid out streets and built houses which constitute the greater part of the town. It has a Roman Catholic

cathedral, several Protestant churches, two colleges (Fernoy college, and St. Colman's Roman Catholic college), two convents, and three branch banks.

FERN, Male. See **MALE FERN.**

FERNANDINA, a port of entry and the capital of Nassau co., Florida, situated on the W. shore of Amelia island, at the entrance of Amelia river, which separates it from the mainland, into Cumberland sound, 160 m. E. by N. of Tallahassee; pop. in 1870, 1,722, of whom 959 were colored. The harbor is landlocked and capacious, and is unsurpassed on the Atlantic coast S. of Chesapeake bay. Vessels drawing 19 or 20 feet of water can cross the bar at high tide, and the largest ships can unload at the wharves. The climate, mild in winter and tempered in summer by the sea breezes, is very healthful. In the vicinity are numerous sugar, cotton, and orange plantations. The town, which is the seat of the Protestant Episcopal bishopric of Florida, contains seven churches, a young ladies' seminary under the charge of the bishop, and a weekly newspaper. It has an important trade in lumber, and possesses a large cotton-ginning establishment and a manufactory of cotton-seed oil. Lines of steamers to Savannah, Charleston, and New York touch here. The value of the foreign commerce for the year ending June 30, 1878, was \$327,859; 52 vessels of 14,789 tons entered from, and 68 of 22,217 tons cleared for foreign ports; entered in the coastwise trade, 112 steamers of 77,708 tons, and 105 sailing vessels of 28,493 tons; cleared, 110 steamers of 76,292 tons, and 106 sailing vessels of 26,021 tons. Fernandina was built by the Spaniards in the early part of this century, but was of little importance until the completion of the Florida railroad, extending from this point to Cedar Keys.

FERNANDO DE NORONHA, a group of small islands in the Atlantic ocean, belonging to Brazil, situated about 210 m. N. E. of Cape St. Roque; lat. of S. E. extremity of the principal island, 8° 50' S., lon. 32° 28' W. The shores are rocky, and difficult of access on account of the violence of the surf. The largest island, which gives the name to the group, is about 20 m. in circumference. In it is a conical mountain about 1,000 ft. high, the upper part of which is very steep, and on one side overhangs its base. It is composed of phonolitic rock, which has been severed into irregular

columns. The island is covered with wood, but such is the aridity of its climate, there being sometimes no rain for two years, that vegetable production is very limited. It contains two harbors, and the coasts abound with fish. It is used as a place of banishment by Brazil, whose government maintains a garrison there to prevent the escape of criminals. No woman is permitted to land on it. Another of these islands is about 1 m. square, and the rest are mere rocky islets, separated from the main islands by very narrow channels.

FERNANDO PO (Port. *Fernão do Po*), an island in the bight of Biafra, W. coast of Africa, about 25 m. from the mainland, lying between lat. 8° 12' and 8° 47' N., and lon. 8° 26' and 8° 57' E.; pop. variously estimated at from 5,000 to 20,000. It is about 44 m. long and 20 m. broad. Rising in bold precipitous cliffs from the sea, its surface gradually becomes more and more elevated, until in Clarence peak, near the N. extremity, it attains an

Clarence Peak, Fernando Po.

altitude of 10,650 ft. The rocks are wholly of volcanic formation. The soil, which is mostly covered with wood, is everywhere well watered and fertile. The scenery is picturesque and beautiful, the highest summits and the deepest vales being alike adorned with luxuriant vegetation. The principal vegetable products are palms, the bombax or silk cotton tree, the goora (*sterculia*), a species of ebony, the sugar cane, here growing wild, and yams, which form the staple food of the inhabitants. The most numerous quadrupeds are antelopes, monkeys, squirrels, and rats. The rivers abound in fish and alligators. The coast is indented with several creeks and bays, the most capacious of which is Maidstone bay, at the N. E. extremity, where is situated the capital, Clarendtown. The aborigines of Fernando Po, called Edeeyaba, are widely different in appearance and language from the natives of

the continent. They are of lighter complexion and better features, well made and muscular, and in disposition brave, generous, and amiable. Their dwellings are of very rude construction, consisting merely of palm-leaf mats thrown loosely over upright poles.—This island was discovered by the Portuguese in 1471, and named after the leader of the expedition. In 1778 it was ceded to the Spaniards, who attempted to colonize it and carry on a slave trade, but were repelled by the natives. In 1827 Spain permitted it to be occupied by the British, who in 1884 abandoned it on account of its insalubrity; since which period the Spaniards have again claimed it and changed its name to Puerto de Isabel, and now use it as a place of banishment for criminals. During the British possession a Baptist mission was established here; but in 1858 the missionaries were expelled by the Spanish government.

FERNEY, or **Fernex**, a town of France, in the department of Ain, on the frontier of Switzerland, at the foot of the Jura mountains, 5 m. N. W. of Geneva; pop. about 1,200. It was a place of refuge for the Huguenots during the era of religious persecution in France, and was for 20 years the residence of Voltaire. When he bought the land, about 1758, Ferney was a miserable hamlet, consisting only of a few hovels. By his exertions it became a prosperous town, with nearly 1,500 inhabitants. He drained and cultivated the adjacent grounds, and caused Geneva watchmakers and other industrious artisans to settle there, while the constant concourse of visitors and travellers contributed to enhance the general prosperity. The death of Voltaire proved disastrous to the industry of the place, the persons employed in the manufacture of watches being reduced from 800 to about 200. The château in which he lived has undergone many alterations, so that few relics of him remain. Adjoining the château are two small edifices, one the theatre and the other the church built by Voltaire. Upon the porch of the latter is the following inscription: *Deo erexit Voltarius*. In front of the château is the mausoleum which he had built with the utmost attention to artistic execution.

FERNIE, **Félicité** and **Théophile de**, French heroines, sisters, born at Mortagne, department of Le Nord, Félicité in 1776, Théophile in 1779. They distinguished themselves by bravery on many occasions, especially at the battles of Valmy and Jemmapes, having enlisted without their father's knowledge in a company of national guards which he commanded in 1792. Their services were officially recognized, and are commemorated in Lamartine's "History of the Girondists." Théophile, who had musical and poetical talents, died in Brussels in 1818. Félicité became the wife of M. Van der Walen, a Belgian officer, whose life she had saved, and died much later.

FERNKORN, **Anton Dominik**, a German sculptor and bronze founder, born at Erfurt, March 17,

1818, died Nov. 16, 1878. He spent a number of years in a foundry at Munich, and attended the academy of Schwanthaler. In 1840 he settled in Vienna, and having produced several excellent works was made director of a government bronze foundry. Among his best productions are the colossal equestrian statue of the archduke Charles, finished in 1860, and the monument to Prince Eugene in 1865. In 1866 he became insane, and was placed in a private asylum at Döbling, near Vienna.

FERNS, the highest order of cryptogamous plants, forming a natural group distinguished for beauty and elegance, and much cultivated for ornament. Ferns are leafy plants producing a stem or rhizome, which creeps below or upon the surface of the earth, and sometimes rises to the height of 50 ft. as a tree trunk, crowned with terminal leaves or fronds. The rhizome is a fibrous woody cylinder, growing only at the end, and so of equal diameter throughout, giving out rootlets anywhere on its surface, and presenting on a cross section a hard fibrous rind composed of the angular bases of fallen fronds, enclosing a cellular tissue with a ring of woody plates, folded and curled, which are in fact the bases of the leaf stalks, and in the centre a cellular mass or highly developed pith. The stem is in fact a consolidated bundle of leaf stalks. The frond is circinate or coiled in veneration, and when unfolded is often of great size (25 ft. long). From this and the minute subdivision of the frond it has been considered rather a leaf-bearing branch than a proper leaf; but there are all gradations from an entire frond to one most minutely divided, and in the latter case the membranous portion proves on examination to be one, however deeply incised. The petiole is never sheathing or articulated at the base, although in some tropical species the base is much enlarged and forms an elastic joint, quite edible. The size of the fronds varies from a diameter of less than a quarter of an inch to an expansion unequalled by any other vegetable except some seaweeds. In several cases buds spring out on the surface or edges of the frond, and thus multiply the species; this is the case in the walking fern, *camptosorus*, where the tip of the elongated hastate frond bends to the earth and takes root, giving rise to new plants. The veins of the pinnæ or leaflets of the fronds are variously arranged, and usually so definitely in each genus as to be used in generic distinctions. The fructification of ferns is always on the lower face of the fronds, which sometimes under its influence are reduced to simple supports in the shape of a spike or panicle; it consists of *sporangia* or capsules, each containing many spores, and usually attached to the nerves or veins, but sometimes covering the whole surface. These capsules are grouped in clusters of various forms called *sori*, and each cluster is often covered until ripe by a fold of the leaf membrane called an *indusium*.—The order of ferns is divided into suborders, most botanists

recognizing as many as eight, founded upon the structure, manner of attachment, and mode of opening of the sporangia. By far the largest of these suborders is the *polypodiaceæ*, or true ferns, which includes the great majority of those with which we are familiar in the wild

fern (*polypodium*) they are round, cinnamon-colored dots in rows each side of the midrib; in hart's tongue (*scolopendrium*) they form numerous obliquely transverse lines; in maiden-hair (*adiantum*) a bit of the edge of the frond folds over the capsules; in the brake (*pteris*)

Rock Fern (*Polypodium vulgare*).

state or in cultivation. In ferns of this suborder the structure of the sporangium is curious. A little bundle of cellular pores on a stem of the same cell formation is clasped around by a ring of thick and elastic segments, each resembling a U with the rounded part inward and the sides united. While the sporangium is alive and full of sap the arms of the U

Maiden-hair (*Adiantum pedatum*).

the whole edge is folded over; and in the *asplenium* and many other ferns the sporangia are in oblong masses pinnately arranged each side of the midrib of the smaller divisions of the frond. In *hymenophyllum*, of a different suborder, the capsules are contained in a calyx-like urn springing from the terminal veins. In the *ophioglossaceæ*, which include our com-

Hart's Tongue (*Scolopendrium officinarum*).

remain almost parallel; but as the ring dries the arms shrink together, and the capsule is ruptured, often with force enough to throw the minute spores to some distance. The position of the sporangia on the frond is an important generic distinction. In the common rock

Common Brake (*Pteris aquilina*).

mon adder's tongue and moon wort, the sporangia are entirely without the elastic ring, and open by a transverse slit into two valves. The spores are very minute and of various shapes, and form the brown (rarely green) dust which falls when a ripe frond is shaken. The mode

in which ferns are fecundated is a modern discovery, but the process may be watched under the microscope by sowing the spores of any common fern in a moist place. The spore swells with the moisture and ruptures its walls; a

little radicle or rootlet is thrown out, consisting of a single cell, and at the same time another cell spreads out as a tube of irregular form, which soon forms partitions through its mass, and by multiplication of these cells becomes a small green leaf-like expansion called a *prothallus*. On the under surface of this spring organs of two kinds, the *antheridia* and *archegonia*. The former are filled with minute spiral bodies called *antherozoids*, which have cilia and the power of motion in water, which is always abundant on the under side of the

adder's Tongue (*Ophloglossum vulgatum*).

prothallus; when mature they pass into the *archegonia*, which are cup-like organs, open when mature, and containing one or more cells which the contact of the *antherozoids* causes to develop, and soon a root appears, then the first frond, and so on until the complete fern is the result.—The species of ferns at present described are 2,285, although some botanists make the number above 8,000. In the earlier geological ages ferns formed a most important part of the vegetation, as is plainly seen in the coal fields, where numerous fronds and stems are preserved; but from the general absence of fructification on these remains, it is often impossible to distinguish the species. They are now found all over the world, but especially in the warmer and moister climates; thus in the Antilles they comprise $\frac{1}{10}$ of the vegetation, in Oceania $\frac{1}{4}$ or $\frac{1}{2}$, in St. Helena $\frac{1}{2}$, in Juan Fernandez $\frac{1}{2}$, and in England $\frac{1}{10}$. The Hawaiian islands and New Caledonia are particularly rich in species. The tree ferns are chiefly confined to the torrid zone, but Martens found them 50 ft. high in Japan, and Robert Brown found arborescent ferns at the extremity of Tasmania, and even at Dusky bay in New Zealand, near lat. 46° S. Most tree ferns are easily propagated by planting sections of their stems, which readily leaf out.—For the classification of ferns, which is very unsettled and depends on technical differences, see Hooker's "Genera," Hooker and Baker's "Synopsis," or Smith's "Ferns, British and Foreign;" and for local descriptions see local floras.—The uses of ferns are not very prominent. On the Hawaiian islands the stem of a tree fern is often baked in the steam cracks of the volcanoes, and by long

cooking becomes quite palatable, although rather leathery, and tasteless without salt. The enlarged bases of the petioles of other species are cooked and eaten in times of scarcity; when raw they smell precisely like a raw potato. The stems and midribs of some smaller species are woven into baskets and hats. A few species are considered medicinal, and some are aromatic and used to scent cocoanut oil.—In cultivation ferns may be adapted to a variety of localities; for, although generally found in shady places, many thrive in the full tropical sun if the air be moist, and some grow on dry rocks and even on the uninviting surface of lava

Tree Ferns.

1. *Alsophila excelsa*. 2. *Dicksonia arborescens*. 3. *Cyathea elegans*. 4. *Cyathea arborea*. 5. *Hemitelia speciosa*. 6. *Drynaria coronata*. 7. *Platynerium grande*. 8. Bird's nest fern. 9. *Asplenium lucidum*.

streams. A compost of peat or bog earth, decayed leaf mould, yellow loam, and silver sand in equal proportions, may be used in potting ferns; but it must be well underdrained, and the addition of a few fragments of mortar or limestone is advantageous. Several species climb on rocks, like ivies; others cling to trees, or, like the beautiful climbing fern (*Lygodium*), run over bushes. About 1880 Mr. N. B. Ward of England, in investigating the transformations of an insect, buried its chrysalis in some earth in a closed glass bottle. A seedling fern and a grass sprang up from the soil and grew within the confined atmosphere of the

vessel. This led to experiments upon the growth of plants, especially ferns, in close cases, and resulted in establishing the fact that these plants would not only grow under such conditions, but that most ferns would flourish much better than in the open air. Wardian cases, which resulted from this discovery, are now in general use for the cultivation of ferns, and are among the most popular as they are the most beautiful of household ornaments.

FÉRON, Firmin Éloi, a French painter, born in Paris, Dec. 1, 1802. He studied under Gros, and received the great prize in 1825 for his picture of "Damon and Pythias." Among his subsequent works are "Hannibal in the Alps" (1833), "The Resurrection of Lazarus" (1835), and "Christ arrested by Judas" and "Souvenir of Tunis" (1855). Many of his pictures are in the museum of Versailles, and he was a favorite painter of Louis Philippe and his sons; but his reputation has declined.

FEROZEPOOR, a town of British India, in the Punjab, about 8 m. S. of the river Ghara, 45 m. S. S. E. of Lahore; pop. about 10,000. The ruins which surround it show that it was once a large city. It came into possession of the British in 1835, since when it has been greatly improved, and bids fair to become of considerable military and commercial importance. In May, 1857, during the sepoy rebellion, a regiment of native infantry revolted, but were driven out of the fort by a handful of Europeans, and fled after plundering and burning the houses, hospitals, and church. In August following a regiment of cavalry revolted, but after killing several persons were repulsed and dispersed.

FERRAND, Antoine François Claude, count, a French politician and historian, born in Paris, July 4, 1751, died there, Jan. 17, 1825. At the age of 18 years he was admitted a counsellor in the parliament of Paris by special dispensation. He left Paris in 1789, and attached himself to the prince of Condé; and after the death of Louis XVI. he was appointed a member of the council of regency. He returned to France in 1801, devoted himself to literature, and published a work, on which he had been long engaged, entitled *De l'esprit de l'histoire*, which was a bold defence of absolute monarchy. He was engaged to complete Rulhière's unfinished *Histoire de l'anarchie de Pologne et du démembrement de cette république*; but the imperial police prevented the publication on the ground that the work belonged to the government, it having been originally written for the instruction of Louis XVI., then dauphin. After the restoration of the Bourbons he was appointed minister of state and postmaster general. He was a member of the academy, and author of several dramatic and a large number of political works, the latter of which were conservative and many of them reactionary in their tendency.

FERRARA. I. A province of Italy, formerly a part of the Papal States, bounded N. by

the main branch of the Po, which divides it from Lombardy, E. by the Adriatic, S. by the provinces of Ravenna and Bologna, and W. by Modena, from which it is partly separated by the river Panaro; area, 1,009 sq. m.; pop. in 1871, 215,869. The surface is flat, and in many parts below the level of the Po, and protected from inundation by embankments along the river. A considerable portion of the E. part of the province is almost constantly under water. In June, 1872, there was a terrible inundation by which 20,000 people were rendered homeless. The soil is rich and fertile, but the vast swamps render the atmosphere more or less unwholesome, especially in summer. The chief products are grain, rice, flax, hemp, wine, olives, and silk. Extensive pastures favor the rearing of cattle, and the fisheries are of some importance. The province formerly constituted the greater part of the duchy of Ferrara, which was ruled by the house of Este from the early part of the 13th century to 1598, when it was annexed to the Papal States. In 1796 it was taken by the French and formed part first of the Cisalpine republic, and afterward of the kingdom of Italy, till 1814, when it was restored to the pope, with the exception of a small portion between the Po di Goro and the Po della Maestra, which was secured to Austria by the congress of Vienna, together with the right of garrisoning the citadel of Ferrara. The province was governed by a papal legate or cardinal, and was called a legation, until November, 1850, when it came under the administration of an inferior prelate. In June, 1859, the Austrian troops were withdrawn from the capital, and in March, 1860, it was annexed to the kingdom of Sardinia. The principal towns besides the capital are Lugo, Cento, Bagnacavallo, and Comacchio, the last a fortified town, situated on an island in the midst of extensive swamps, and noted for its fisheries, which are celebrated by Tasso and Ariosto. **II.** A city, capital of the province, situated in a flat unhealthy country, only about 7 ft. above the level of the sea, on the left bank of the Volano, branch of the Po, about 5 m. S. of the main channel of that river, 26 m. N. E. of Bologna and 38 m. N. W. of Ravenna; pop. as a commune, in 1871, 72,447, of whom less than one half were in the city proper. Ferrara was a small village until the beginning of the 7th century, when it was walled by the exarch of Ravenna. The bishopric of Ferrara dates from 661, the archbishopric from 1785. A general council was convened here in 1488, but was removed to Florence. (See EUGENIUS IV., and FLORENCE, COUNCIL OF.) Under the rule of the princes of Este the city gained great importance, especially in the 16th century, when it was celebrated for learning, poetry, art, and the refinement and splendor of its ducal court. In the 15th century it was famous for its school of painting. In the early part of the 16th it gave an asylum to Calvin

and other religious reformers. Guarini, Boiardo, Ariosto, and Tasso were among the most illustrious ornaments of its court. The city had in its most prosperous period about 100,000 inhabitants. It still retains many vestiges of its former splendor. The churches contain fine works of art, especially that of the Campo Santo, which occupies the site of the old Certosa convent. The cathedral of St. Paul was consecrated in 1185, and contains the tomb of Urban III. Santa Maria del Vado is the oldest church, but has been entirely altered by modern restoration. That of San Francesco is famous for its echo, which has 16 reverberations. Ariosto was buried in the church of San Benedetto, but in 1801 his remains were removed to the public library.



Castle of Ferrara.

The finest of the palaces of Ferrara are the Diamond palace, or Villa Ercole, and the palazzo del Magistro, where the *accademia Ariostea* holds its sittings. In the hospital of Santa Anna a small room on the ground floor is still shown in which Tasso is said to have been confined as a lunatic for many years by Alfonso II., but the identity of this room with his place of confinement is now very generally disbelieved; and near the city is the villa Bel Riguardo, where the poet enjoyed the society of Eleonora of Este. The university of Ferrara was founded in 1321, renovated in 1402, closed in 1797, and reopened in 1824. It was again closed during the revolutionary troubles

of 1848-'9, and reopened Nov. 1, 1850, after the reestablishment of the papal authority. It is chiefly renowned as a school of jurisprudence and medicine, and is attended by 200 to 800 students. It contains a collection of antiquities, a library of 80,000 volumes and 900 MSS., comprising some of Guarini, Ariosto, and Tasso, and many valuable editions of the 15th and 16th centuries. Ferrara possesses one of the finest and largest theatres of Italy, a botanical garden, and many charitable institutions and convents. In the centre of the city is a castle flanked with towers and surrounded by wet ditches, which was formerly the palace of the dukes. The population is chiefly collected in the vicinity of this castle, and but thinly scattered elsewhere. The city is enclosed with walls and defended on the W. side by the citadel. The Austrians took possession of the whole city in August, 1847, but the troops were withdrawn in December, and the Austrian occupation remained confined to the citadel until July 14, 1848, when the city was again seized by Prince Liechtenstein. On Feb. 18, 1849, it was occupied for a short time by Gen. Haynau, who imposed upon the inhabitants a contribution of 200,000 scudi. In June, 1859, after the battle of Magenta, the Austrian forces withdrew from the citadel, and it was destroyed.

FERRARI, Gaetano, a painter of the Milanese school, born at Valduggia in 1484, died in Milan in 1550. His principal works are illustrative of the story of creation and of the early events of Christianity, and are found in the galleries and churches of Lombardy. He was also a sculptor, architect, mathematician, and poet.

FERRARI, Giuseppe, an Italian philosopher and historian, born in Milan in 1812, died there, July 2, 1876. In 1831 he graduated as a doctor of law at Pavia, but devoted himself to literature and philosophy, and became a disciple of Romagnosi. In 1835 appeared his complete edition of the works of Vico, reprinted in 1858, in Milan, in the collection of Italian classics. In 1837 he went to France, and published in 1839 *Vico et l'Italie*. In 1840 he became professor of philosophy at the college of Roehfort, and afterward at Strasburg, but soon lost his office on account of his radicalism. In 1847 he published *Essai sur le principe et les limites de la philosophie de l'histoire*, his most important work. After the revolution of Feb. 24, 1848, he was reinstated in his chair at Strasburg; but the dislike of the French clergy followed him there, and to Bourges, whither he removed at the end of that year, and they eventually succeeded in procuring his dismissal (June 18, 1849). In 1859 he returned to Italy and became a member of parliament, and successively professor in Turin, Milan, and Florence. He was the foremost Italian representative of positivism, and attempted a philosophical reconstruction of the political development of nations, founded exclusively upon experience and induction.

His later works include *Filosofia della rivoluzione* (1851); *Histoire des révolutions d'Italie* (4 vols., Paris, 1856-'8); and *Corso di lezioni sugli scrittori politici italiani* (1862-'3).

FERRARI, Luigi, an Italian sculptor, born in Venice in 1810. He studied under his father Bartolommeo, an eminent artist, and was early employed in connection with Canova's monument to Titian. In 1827 he exhibited his first work, a statuette of the Virgin; and since 1851 he has been professor of statuary at the academy of fine arts in Venice. Among his principal works are "Laocoön," in the museum of Brescia; two figures representing a "Nymph collecting Lotus" and "Melancholy;" and marble statues of King David, of the Madonna della Concezione, of Marco Polo, and of St. Justus, in Trieste. He has executed many funeral monuments, and busts and statues of angels, nymphs, and children.

FERRE, Théophile Charles, a French communist, born about 1845, executed at Satory, near Paris, Nov. 28, 1871. He was a merchant's clerk, and was early implicated in revolutionary movements. During the insurrection of March, 1871, he favored the assassination of Gens. Leconte and Clément-Thomas, and became a member of the commune and of the commission of public safety, adjunct procurator general, and prefect of police. On May 27 he presided over a massacre of hostages, after having released and armed the inmates of the penitentiary and converted them into executioners. One of the most ferocious terrorists, he set fire to the prefecture of police, and ordered the burning of the ministry of finance. Previous to his execution, he wrote to his sister that he died as he had lived, a materialist.

FERREIRA, Antonio, a Portuguese poet, born in Lisbon in 1528, died there of the plague in 1569. He was a contemporary of Camões, and perfected the elegiac and epistolary style already introduced with success by Sa de Miranda. He enriched Portuguese poetry with the epithalamium, the epigram, ode, and tragedy, and the influence which he exerted in kindling a love for classical scholarship caused him to be called the Horace of Portugal. His *Poemas lusitanos*, which are distinguished by remarkable purity of language, appeared in 1598, and his complete works in 1771. His best comedy is *Comedia do ciioso* (the "Jealous Man"), and his masterpiece is the tragedy of *Ines do Castro*. An English translation of this tragedy, by Mr. Musgrave, appeared in 1825.

FERRET, a carnivorous digitigrade animal, belonging to the weasel family, and the genus *putorius* (Cuv.). The dentition is: incisors, 4; canines, 2; molars, 12, two above and three below being false molars. Since the time of Linnaeus the ferret has been generally considered a southern or albino variety of the polecat (*P. fœtidus*, Klein), principally from their producing offspring together; but they may more properly be considered distinct species for the following reasons: the ferret is

a native of Africa and warm regions, and only exists in Europe in a domesticated state, being very sensitive to cold, and requiring the protection of man; its size is smaller, its shape more slender, and its snout sharper than in the polecat; and its habits, though quite as sanguinary, do not enable it to live wild in the woods. The length of the ferret (*P. furo*, Linn.) is from 12 to 14 in. from nose to base of tail, the latter being about 5 in. long. It is an error to suppose that the ferret is always white, with pink eyes, as such individuals are only albino varieties, such as occur in many other animals; the general color is an irregular mixture of yellow and black, the fur being long and fine, with an undergrowth of cinereous woolly hair; the yellowest animals are most subject to albinism. Both sexes are alike in color, but the male is the larger, being about 3 in. high at the shoulder and 4 in. at the sacrum. Though ranked as a domesticated animal, and employed by man to hunt rabbits and rats, it is far from docile or gentle, and never seems to have any affection for those who feed

Ferret (*Putorius furo*).

and take care of it. According to Strabo, it was introduced from northern Africa into Spain, whence it has spread over Europe. In its natural condition it has the habits of the polecat and weasels, sucking the blood of small quadrupeds and birds, and devouring eggs; it is nocturnal, sleeping nearly all day; in captivity it is fed on bread and milk and raw meat. It produces young twice a year, and from five to eight at a time; gestation is about six weeks, and the young are said by F. Cuvier to be born hairless and with closed eyes, and to be frequently devoured by the mother. Its natural enmity to the rabbit has been taken advantage of by man, who trains it to enter the burrows of these animals, and to drive them out into nets spread over the entrance; the ferret is muzzled to prevent its killing the rabbits, otherwise it is believed it would suck their blood, and go to sleep in the burrow. It will also soon rid a house of rats and mice. For these reasons the ferret is cared for by man, without whose aid it would not survive in Europe; it is carefully bred in

captivity, and sometimes crossed with the polecat, which is supposed to increase its ferocity. The ferret is easily irritated, and then emits a strong disagreeable odor. It is generally believed that the ferrets kill by sucking the blood of their victims, aiming at the jugular vein or the great vessels of the neck; but the rapidity of the death is entirely inconsistent with so long a process as this. Experiments have shown that the ferret often inflicts but a single wound, which is almost instantly fatal, and frequently immediately disengages itself from the body of its victim to attack and kill another in a similar manner; the single wound is in the side of the neck, under or behind the ear, and may or may not pierce the large blood vessels; the canines enter the spinal cord between the skull and the first vertebra of the neck, destroying its victim by the same process as the bull-fighter with his keen sword, or the Spanish executioner with the steel point of the garrote, making neither a lacerated nor a contused wound, but penetrating into the medulla oblongata, the very centre of life, instantly arresting the action of the heart and respiratory muscles, and at once destroying consciousness, sensation, and motion. This is one of many instances in which the instinct of animals has anticipated the slow deductions of science. The truth seems to be that when the animal is of small size, it is killed by the ferret by wounding the upper part of the spinal cord; but that when it is of superior size and strength, the ferret seizes it wherever it can, producing death by loss of blood, pain, and exhaustion of strength. After the animal is dead, the ferret, like other weasels, no doubt sucks its blood, though the statement generally made in works on natural history, from Buffon to F. Cuvier and Geoffroy Saint-Hilaire, that death is uniformly caused in this manner, is untrue.

FERRIER, James Frederick, a Scottish metaphysician, born in Edinburgh in November, 1808, died at St. Andrews, June 11, 1864. He was a nephew of Miss Ferrier the authoress, graduated at Oxford in 1832, and was admitted the next year to the Scottish bar. He married a daughter of Prof. James Wilson, whose collected works he subsequently edited; and he early contributed to "Blackwood's Magazine" essays on philosophical and literary subjects. In 1842 he was elected professor of history in the university of Edinburgh, and in 1845 of moral philosophy at St. Andrews. His lectures and conversation displayed great learning, independence of thought, and felicity of expression, and he was one of the ornaments of the intellectual circles of Edinburgh. His principal work, "Institutes of Metaphysics: the Theory of Knowing and Being," appeared in 1854; and his "Lectures on Greek Philosophy" and other philosophical remains were edited by Sir A. Grant and E. L. Lushington (2 vols., 1866). He attempted to construct a system of idealism, which however has found few if any disciples; but he called attention

to many vital principles of thought, and Ueberweg accords to him in his "History of Philosophy" a rare preëminence among English philosophical writers.

FERRIER, Susan Edmonston, a Scottish novelist, born in Edinburgh about 1782, died there in November, 1854. Her works, all published anonymously, are: "Marriage" (1818), "The Inheritance" (1824), and "Destiny, or the Chief's Daughter" (1831). She possessed a rare ability for delineating national characteristics, genial wit, and a quick sense of the ludicrous. Sir Walter Scott pays a tribute to her talent at the conclusion of his "Legend of Montrose." She was his frequent guest at Abbotsford, and contributed by her society to relieve the sadness which clouded the last days of his life. She was never married.

FERRIERES, a village of France, in the department of Seine-et-Marne, 15 m. E. of Paris; pop. about 800. In the 17th century it was a marquise, afterward belonged to Fouché, and was finally purchased by Baron Rothschild, for whom the English architect Paxton built here one of the most magnificent châteaux in France, in the style of the last period of Italian renaissance. From Sept. 19 to Oct. 5, 1870, it was the headquarters of King William of Prussia. An interview between Jules Favre and Bismarck took place there immediately after the arrival of the king.

FERRO, or **Hierro**, the most westerly and smallest of the Canary islands, in lat. 27° 40' N., lon. 18° W.; length 18 m., greatest breadth 9 m.; area, about 100 sq. m.; pop. about 4,600. The ancient geographers supposed this to be the westernmost point of the world, and drew through it the first meridian; they are imitated by the Germans (who place it at 17° 40' from Greenwich), and others of eastern Europe who follow them. Chief town, Valverde.

FERROL, a seaport city of Spain, on the N. arm of the bay of Betanzos, in the province and 12 m. N. E. of the city of Corunna; pop. about 23,000. Its harbor, which is defended by Forts Palma and San Felipe, is one of the best in Europe. The town is well built, and protected on the land side by formidable fortifications. It has an immense marine arsenal, covering nearly 24 acres, with a basin and docks, which are among the finest in Europe. The marine barracks afford accommodation for 6,000 men. In connection with the arsenal there is a school for seamanship and engineering; there is also a naval observatory. Ferrol has a few manufactures, but being a military port, foreign merchant vessels are excluded from it. It was but a small fishing town prior to 1752, when its fortifications were begun by Ferdinand VI. The English failed in an attack upon it in 1799, but it was taken by the French in 1809 and 1823.

FERRUM. See IRON.

FERRY, a place where persons, animals, or goods are carried across a river or other water; in law, a liberty or franchise so to

transport persons or things. Such a franchise can exist in England only by grant from the king, or by a prescription which supposes a grant; and being granted and accepted, the grantee is indictable if he have not suitable means of transport. In the United States, ferries are created as well as regulated generally by statutes, although there may be ancient ferries resting on usage and prescription. The termini of the ferry are at the water's edge, and shift with that if it varies; but the owner has a right of way to and from the ferry. Ferry-men are common carriers, and have the rights and come under the obligations of common carriers. Thus, they may determine (within reasonable limits) when and how often, and upon what terms, their boats shall cross the water, and what they will transport; but all these things they must do by general rules, without favoritism or arbitrary exception. They are liable for all loss of or injury to property in their possession, unless it be caused by the act of God or of the public enemy. This liability does not attach when persons or things are coming toward or going from their boats, but begins as soon as they are on the boat, or on the slip or flat, and continues while they are there. One who owns a ferry, and employs persons to do all the labor and the actual transport, is in law the ferryman, and liable accordingly. But if he leases the ferry, reserving only his rent, the lessee in possession, and not the owner, is the responsible ferryman; and this is true even if the rent reserved be a certain proportion of the receipts.

FERSEN, Axel, count, a Swedish soldier, born in Stockholm about 1750, killed June 20, 1810. He was educated at the military academy of Turin, and entered the Swedish army, but afterward went to Versailles, and was made colonel of the royal regiment of Sweden, the body guard of Louis XVI. He served in the American revolutionary war with distinction, and was aide-de-camp of Rochambeau at Yorktown. Upon his return to France he became a devoted adherent of the Bourbons, and Marie Antoinette especially distinguished him. In the flight to Varennes Fersen was the disguised coachman of the royal fugitives. After their capture he escaped, and was employed by Gustavus III. in furthering the project of reinstating the Bourbon dynasty in France. Toward the end of his life he became the favorite of Charles XIII., and his sister enjoyed in an equal degree the favor of the queen; but both were unpopular with the people. Fersen was made grand marshal of the kingdom; but the sudden death of the crown prince, Christian Augustus of Augustenburg, gave rise to suspicion that Fersen had poisoned him. A tumult occurred at the funeral, and while the troops looked on with indifference, the mob killed Fersen with sticks and stones in the great square of the Riddarhus in Stockholm. His sister escaped in disguise. It is now universally acknowledged that Fersen was guiltless.

FESCA. I. Friedrich Ernst, a German composer and musician, born in Magdeburg, Feb. 15, 1789, died May 24, 1826. His father held a minor municipal office in Magdeburg, and devoted much of his time to the practice of the violoncello and piano, and his mother had been a professional vocalist in early life. When he was but four years of age he could perform pieces of moderate difficulty upon the piano, and began the violin. He studied harmony and counterpoint under the instruction of Müller at Leipsic. In 1805 he made his first public appearance as a violinist, playing a concerto of his own in E minor. He soon after became attached to the chapel royal at Cassel, where he remained till 1818. After the dissolution of the kingdom of Westphalia he went to Vienna, and thence to Carlsruhe, where he became attached to the court of the grand duke of Baden. Here he remained 11 years and composed the majority of his works, including quartets and quintets for stringed instruments, overtures, symphonies, two operas, and settings of several of the psalms for solo voices, chorus, and orchestra. He was a man of noble disposition, kindly heart, and much devotional feeling. His works, formed on the best models, display a refined and elevated taste and a delicate fancy. **II. Alexander Ernst**, a German composer and musician, son of the preceding, born in Carlsruhe, May 22, 1820, died in Brunswick, Feb. 22, 1849. He studied the piano under Taubert and composition under Rungenhagen and Wilhelm Bach. At the age of 18 he brought out at Carlsruhe a comic opera entitled *Mariette*. His compositions evinced a fine original and progressive talent, especially his chamber music and songs, many of which have been republished in this country.

FESCENNINE VERSES, licentious poems sung at the private festivals of the ancient Romans, particularly at nuptial celebrations. They derived their name and origin from Fescennium, an Etruscan city, where they seem to have been a rude dramatic entertainment improvised in the intoxication of rustic festivals. They were composed with the most unbounded license, accompanied with uncouth posturing and dances, and gave delight to the yet savage and untaught Romans. The later satire and comedy took their origin from them, and Catullus introduced them into his epithalamia; but in attaining a better literary character these verses hardly improved their morals.

FESCH, Joseph, cardinal, and archbishop of Lyons, born in Ajaccio, Corsica, Jan. 8, 1768, died in Rome, May 18, 1839. He was the son of a Swiss officer in the Genoese service, and half brother of Letizia Ramolino, the mother of Napoleon Bonaparte. He was archdeacon of the chapter of Ajaccio when the chapters were suppressed by the revolution of 1789. In 1798 he was exiled with the Bonapartes, and being without resources laid aside his priesthood and was appointed commissary of war to the army of Italy, of which subsequently his nephew

Napoleon received the command. He resumed his ecclesiastical functions when the first consul determined to reestablish in France the Catholic worship, and was active in the negotiations between Napoleon and Pius VII. which prepared for the concordat of July 15, 1801. The influence of his nephew made him archbishop of Lyons in 1802, and obtained a cardinal's hat for him in 1808. As ambassador of France at Rome in 1804, after conducting the negotiations, he accompanied Pius VII. on his way to Paris to crown the emperor. Many civil dignities and emoluments were subsequently conferred upon him, but in 1809 he declined the archbishopric of Paris, to which Napoleon, wishing to make some one of his family the head of the French clergy, nominated him. He was president of the council which sat in Paris in 1810, and also of the national council of 1811, called to consider the disagreement between Napoleon and the holy see concerning the nomination of bishops. In this capacity he did not satisfy the emperor, and for a time he disappeared from court; and he afterward adhered to the pope, greatly to the displeasure of his nephew. Upon the fall of Napoleon he retired to Rome, but was recalled to Paris during the hundred days. After the battle of Waterloo he lived in retirement in Rome. His collection of paintings, one of the largest ever brought together by a single person, was dispersed after his death.

FESSENDEN, Thomas Green, an American author and journalist, born in Walpole, N. H., April 22, 1771, died in Boston, Nov. 11, 1837. He graduated at Dartmouth college in 1796, and studied law in Vermont, employing his leisure hours in writing humorous poems and other papers for the "Farmer's Weekly Museum" of Walpole, then edited by Joseph Dennie. In 1801 he went to England as the agent for a newly invented machine, the failure of which to answer its purpose involved him in pecuniary difficulties. He produced in 1803 a poem entitled "Terrible Tractoration," in which the metallic tractors of Perkins are advertised, and the medical profession is satirized. It was successful in London, where it was published anonymously. It was republished in New York in 1804, and again in 1806 in an enlarged form, under the title of "The Minute Philosopher." A third edition appeared toward the close of the author's life. He returned to America in 1804, and was engaged in various avocations till 1822, when he commenced the publication of the "New England Farmer," with which he remained connected during the remainder of his life. He also edited the "Horticultural Register" and the "Silk Manual," and contributed articles to a variety of journals. His remaining works are: "Original Poems," published in England and America; "Democracy Unveiled" (1806); "American Clerk's Companion" (1815); "The Ladies' Monitor" (1818); and "Laws of Patents for new Inventions" (1822).

FESSENDEN, William Pitt, an American statesman, born in Boscawen, N. H., Oct. 16, 1806, died in Portland, Me., Sept. 8, 1869. He graduated at Bowdoin college in 1823, was admitted to the bar in 1827, and commenced practice in Bridgton, Me., but in 1829 removed to Portland, where he soon attained eminence as a counsellor and advocate. He belonged to the whig party, was a member of the legislature of Maine in 1832 and again in 1840, and from 1841 to 1848 was a representative in congress. He was again in the legislature in 1845-'6 and 1853-'4. In the latter year, although the legislature was democratic in both branches, he was chosen, by a union of the whigs and freesoil democrats, United States senator, an office which he held almost uninterruptedly until his death. This election, brought about by the disturbing elements introduced by the Kansas-Nebraska question, was the preliminary step toward the establishment in Maine of the republican party, of which he was one of the chief organizers. In 1861 he was a member of the "peace congress." In July, 1864, he was appointed by President Lincoln secretary of the treasury, to succeed Salmon P. Chase; but he resigned the position in 1865 to resume his seat in the senate. During his connection with this body he served as chairman of the finance committee and of the committee on public buildings and grounds, as a member of the committees on foreign relations and the library, as regent of the Smithsonian institution, and as chairman of the special joint commission on reconstruction. He was the author of the report of the last named committee, recommending an amendment to the constitution. On the impeachment trial of President Johnson, he was one of the few republican senators who voted for acquittal. He was an invalid during the later years of his life.

FESSLER, Ignaz Aurelius, a Hungarian author, born in 1756, died in St. Petersburg, Dec. 15, 1839. He was a Capuchin friar, but was dismissed from that order and became professor of oriental languages and hermeneutics in Lemberg, where his tragedy of *Sidney* was performed in 1787. This being denounced as impious and revolutionary, he was obliged to flee, and repaired to Silesia. He embraced Protestantism, and in 1796 went to Berlin, where he joined Fichte in reforming a lodge of freemasons. In 1809 he became professor of oriental languages and philosophy at St. Petersburg, but soon lost this office on account of his alleged atheistic doctrines. Subsequently he was Protestant bishop of Saratov, and from 1833 till his death was general superintendent and ecclesiastical councillor of the Lutheran community of St. Petersburg. He was often involved in difficulties, especially as member of a Russian official committee at Sarepta, where he was charged with wishing to convert the Moravian community of that city into a Protestant organization similar to that of the Jesuits. His principal work is *Geschichte der Ungarn und deren*

Landassen (10 vols., Leipsic, 1812-'25). He also wrote several historical novels, and works relating to oriental languages and philosophy, freemasonry, and literature, and an autobiography (*Rückblicke auf meine siebenjährige Pilgerschaft*, Breslau, 1826; 2d ed., 1851).

FESSLER, Joseph, an Austrian prelate, born at Lochau, Tyrol, Dec. 2, 1813. In 1837 he was ordained priest in Brixen, and devoted himself to teaching. He was professor of history and canon law for eleven years in the seminary of Brixen, and for four years in the university of Vienna, where he filled for four years more the newly established chair on the "Decretals." In 1861 the pope summoned him to Rome, and employed him in managing the affairs of the eastern churches, appointing him also consultant of the Propaganda on oriental rites. The bishop of Brixen at the same time named him his vicar general. Pius IX. nominated him, April 7, 1862, bishop of Nyssa *in partibus*; and on March 27, 1865, he was made bishop of St. Pölten in Lower Austria. His long studies and labors on patrology, church history, and canon law, as well as in all that relates to the holding of diocesan, provincial, and general councils, caused the pope to designate him in 1869 as secretary of the council of the Vatican.

FETH ALI, Futeh Ali, Fateh Ali, or Fath' Ali, shah of Persia, called before his accession Baba Khan, born about 1762, died in 1834. In 1797 he succeeded his uncle, Aga Mohammed, founder of the Kadjar dynasty, after having put down several claimants to the throne. In 1799 Col. Malcolm was sent by the governor general of India on a mission to Feth Ali, and concluded a treaty by which the latter was to attack Khorasan and Afghanistan, and receive subsidies from England for that purpose. In 1803 war broke out between Persia and Russia for the possession of Georgia, whose ruler had transferred his allegiance from the former to the latter power. In 1805 Napoleon offered Feth Ali his alliance and protection in the prosecution of the war, and in 1807 sent Gen. Gardanne as ambassador to Persia. The treaty of Tilsit having, however, put an end to hostilities between France and Russia, the Persian king abandoned the French alliance for that of the English; but he was obliged in 1813 by the successes of the Russians to yield Georgia to the czar by treaty. In 1821 a war broke out between Persia and the Ottoman empire on account of the extortions and oppressions practised by Turkish functionaries upon Persian pilgrims, and was terminated in 1823 by a treaty favorable to Persia. In 1826 Feth Ali, thinking to profit by the death of the czar Alexander, and to reconquer Georgia, declared war against the Russians; but his army, commanded by his favorite son Abbas Mirza, was vanquished by Gen. Paskevitch, and he was forced in 1828 to abandon Persian Armenia to Russia, and to make the Aras the boundary of his dominions. He amused himself in his leisure

with writing verses, and left a collection of odes and songs. He had 500 females in his harem, and in 1826 is said to have had 81 sons and 53 daughters. He was succeeded by his grandson Mohammed, the son of Abbas Mirza, who died shortly before his father.

FETIALES, or Fedales, in ancient Rome, a college of priests, consisting of 20 members belonging to the noblest families, who held office for life, with power to fill vacancies in their number, and whose duty it was to carry the complaints and grievances of the Roman people before the magistrates and rulers of offending cities and tribes, to ask redress, to declare in case of refusal whether there was sufficient reason for hostilities, to perform the religious rites of warning the enemy, of declaration of war, and of ratification of peace, and to watch over the strict observance of treaties. This institution is believed to have existed among the people of Etruria. Its introduction at Rome is attributed by some to Numa, by others to Ancus Marcius. When the policy of Rome became that of continual conquest, the institution lost its influence, preserving only its religious character. The etymology of the term is uncertain. It has been variously derived from the Latin words *fides*, *fedus*, *ferio*, and *facio*, and the Greek *φῆμι*.

FETICHISM, Fetichism, or Fetishism (Port. *feitico*, magic; perhaps connected with the Lat. *fascinum*, a bewitching), the religious worship of material things (fetiches) as the abodes of spirits. It is the lowest of the forms of worship found among uncivilized tribes, and exists especially among the negroes in Africa. There are two kinds of fetiches, natural and artificial. Among the former are celebrated rocks, particularly high mountain peaks where the lightning is supposed to dwell; single trees, and more frequently whole forests; many animals, as serpents, one of which has its own temple, where the snakes are kept by priestesses; snails, crocodiles (with the Ashantees), goats, sheep, &c. Usefulness and hurtfulness seem to have often dictated their selection, but not always. Artificial fetiches are either public, preserved by priests, or private, purchasable from them usually at a very high price. Kings and princes have large collections of fetiches, and every family has at least one. They are hereditary, and either hung up in the dwellings or worn on the neck or elsewhere, and even fastened on domestic animals. Occasionally they are made in rude imitation of the human form, and the public fetiches are sometimes of gold and very large. The worshippers provide their fetiches liberally with food, but if their prayers are not granted they frequently throw them away, or beat them to pieces. They have also festivals and sacrifices. For the latter the victims are oxen, swine, and other animals; but sometimes criminals, prisoners, or persons of the lowest classes of the tribe are immolated. The festivals are generally attended by excess in drinking, thefts,

fight, and gross licentiousness. The priests form a separate society, with hereditary dignity, property, and privileges. They have in particular the right of retaining the slaves who come to them, or, as they call it, present their bodies to the fetich. The limits of the term fetichism are yet unsettled, as some exclude from it the worship of forests, mountains, rivers, &c., and all such as are made to resemble the human form.

FÉTIS, François Joseph, a Belgian composer and writer on music, born in Mons, March 25, 1784, died in Brussels, March 27, 1871. His father was an organist, and at the age of ten he was engaged as organist in his native town. Subsequently, after taking lessons from the most eminent teachers in Paris, he travelled in Germany and Italy, and made himself familiar with the works of the great masters of those countries. He returned to Paris in 1806, married a rich woman, and devoted himself to the study of the history of music, especially of that of the middle ages. In 1818, a reverse of fortune obliging him to return to the practice of his profession, he became organist and teacher of music at Douai, and in 1818 was appointed professor in the conservatory of Paris, and soon after published his *Traité du contrepoint et de la fugue*. In 1827 he founded the first journal devoted to musical criticism that had appeared in France, the *Revue musicale*, which he edited till 1835. At the same time he was pursuing his researches upon the theory of harmony, writing articles for various periodicals, and volumes upon the history and curiosities of music, and composing operas and pieces of sacred music. In 1832 he began his historical concerts, which have since found imitators in Germany and England. In 1833 the king of Belgium appointed him chapel master and director of the royal conservatory of Brussels. In 1864 he superintended the production of Meyerbeer's opera *L'Africain*, in accordance with a direction in the will of the composer. His own most successful opera was *La vieille*, which was performed for 100 nights. As a writer on musical history he is unrivalled, and his works on almost every topic connected with music are numerous. His principal writings are: *Biographie universelle des musiciens, et bibliographie générale de la musique*, preceded by an epitome of the history of music (8 vols., Brussels, 1835-'44); *Traité complet de la théorie et de la pratique de l'harmonie, contenant la doctrine de la science et de l'art* (Paris, 1853); and a sketch of Meyerbeer in the *Revue contemporaine* (Paris, 1859).—His son **ÉDOUARD FRANÇOIS LOUIS**, born at Bouvines, May 12, 1816, was appointed in 1838 conservator of the royal library of Brussels, and is the author of *Les musiciens belges* (2 vols., 1848), *Les artistes belges à l'étranger* (vols. i. and ii., 1858), &c.

FEUCHÈRES, Sophie de, baroness, mistress of the last prince of Condé (Louis Henri Joseph, duke de Bourbon), born in the Isle of Wight

about 1795, died in England, Jan. 2, 1841. She was the daughter of a fisherman named Clarke, represented herself as the widow of a Mr. Dawes, and is believed to have been on the stage; but the accounts of her life are conflicting until about 1817, when she became the mistress of the prince of Condé. At his instigation she married in 1818 the baron Adolphe de Feuchères, who became a member of his household, when the prince settled upon her 72,000 francs per annum. In 1822 she was divorced from the baron. She exercised over Condé an almost unbounded influence. In 1824 he presented her with the domains of Boissy and St. Leu, and in 1825 with 1,000,000 francs, besides leaving her 2,000,000 by his will, dated Aug. 30, 1829. A year afterward (Aug. 27, 1830) the prince was found hanging in his room, under circumstances which fixed the suspicions of his relatives upon the baroness, and also upon Louis Philippe; for in order to ingratiate herself with the Orleans family she is said to have prevailed upon the prince to bequeath the bulk of his large fortune to his godson, the duke d'Aumale, a disposition which just before his death he seemed inclined to revoke in favor of the count de Chambord. His relatives accused her of having murdered the prince, and insisted upon a judicial investigation; but nothing could be proved against her, and the prince's death was ascribed to suicide. (See *Histoire complète du procès relatif à la mort et au testament du duc de Bourbon*, Paris, 1832.) She left her immense fortune to her niece, Mlle. Sophie Tanceron. The baron de Feuchères gave to the hospitals of Paris his whole share in the property of his former wife.

FEUDAL SYSTEM, the name given to the condition of society that prevailed in Europe during the middle ages. Its germs were probably Asiatic, and in Asia, though never so fully developed, it has outlasted the system established in Europe. It had the firmest existence in France, Germany, Aragon, a large part of Italy, England after the conquest, and Scotland, while other European countries were more or less influenced by it. The system grew up in Europe from the 5th to the 9th century, and was the consequence of the perpetual struggle of civilization against barbarism. Like all systems that have lived for any great length of time, it had a progressive formation. The struggle out of which it grew began with the fall of the imperial authority in so many parts of the Roman empire; and when feudalism had established itself, the way had been prepared for a far greater advance toward the establishment of civilization. In France, feudalism was brought into a rude but intelligible form in the 10th century, and "the feudal period" is held to synchronize with the ten generations during which the throne of that country was held by the elder branch of the Capet family, 987-1328. For some generations previous to the extinction of the Carolingian dynasty it had had a

rude existence, and many of its incidents are traceable in legislation to the reign of Charlemagne, throughout the limits of whose vast dominion feudalism had at a later period its fullest continental development. "The regular machinery and systematic establishment of feuds, in fact," says Hallam, "may be considered as almost confined to the dominions of Charlemagne, and to those countries which afterward derived from them." But it is not until a much later time that we find "the feudal period" clearly established. As the chief object of the great monarchs of the Carlovingian line was the establishment of a consolidated empire, it can scarcely be held that they deliberately sought to develop a system whose very essence was the disintegration of every country in which it existed. The imbecility of the later kings of the second race favored the advance of feudalism in France; and in that country it was known earlier than anywhere else, and there it received its essential peculiarities. At the time of the conquest of Gaul, and the rise of the Merovingians, there were many freeholds, that is, independent properties; but in the course of the five following centuries most of these had disappeared. The beneficiary condition became the common condition of territorial property. Benefice and fief are words that express the same facts at different dates. In the middle of the 12th century *feodum* and *beneficium* were used interchangeably, as they had been used for some time previously to that date. The exact nature of benefices has been the source of considerable dispute, but the better opinion is that their ordinary duration was the life of the possessor, after which they reverted to the fisc; yet there were instances of hereditary benefices as early as the Merovingian times. The tendency to retain property in their families would lead men to make use of a variety of means to render what they held hereditary, while the weakness of the kings would not enable them to resist claims powerfully urged in behalf of the sons of beneficiaries. Under the feudal system the territorial element was known as the fief, and it has been argued that this did not mean originally the land itself, but only the tenure thereof, its relation of dependence toward the suzerain; but the weight of authority is adverse to this view, though it is admitted that at a later period some such distinction may have been made. The titles, or most of them, which became so identified with feudalism, were not originally hereditary, but were made so gradually, like the property possessions which rendered the great vassals so powerful. Dukes, counts, and marquises, or margraves, were at first provincial governors, officers intrusted with certain specific duties, the margraves being charged with the custody of the frontiers. The weakness of the Merovingian kings made these officers very important persons in the state. The Carlovingians sought to lessen their power, and with some success so long as that

race produced able kings; but under Charlemagne's successors the counts rapidly acquired influence and wealth, and political station. The same man was allowed to enjoy several counties, in all of which he endeavored to acquire landed property, and to assume a right to his dignities. In the last quarter of the 9th century the succession of a son to a father's county was a recognized usage; and "in the next century," says Hallam, "there followed an entire prostration of the royal authority, and the counts usurped their governments as little sovereignties, with the domains and all regalian rights, subject only to the feudal superiority of the king. They now added the name of the county to their own, and their wives took the appellation of countess. In Italy, the independence of the dukes was still more complete; and although Otho the Great and his descendants kept a stricter rein over those of Germany, yet we find the great fiefs of their empire, throughout the 10th century, granted almost invariably to the male and even female heirs of the last possessor." Thus the hereditary principle was recognized in a double respect—as related to the possession of land, and as related to the possession of political power. The counts became the enemies of the allodial proprietors, whose importance was derived from a system entirely unlike that upon which their consequence rested. The king and the law could not protect the allodialists or independent proprietors from being spoiled by their enemies. Many of them surrendered their lands, and received them back upon feudal conditions; or they acknowledged themselves vassals of a suzerain. Yet the allodial lands were not entirely extinguished. They were common in the south of France, the strength of the feudal tenures being between the Somme and the Loire. According to the old French law, allodial lands were always noble, like fiefs, down to 1580. In the German empire many estates continued to be held by allodial tenures. This part of the subject is involved in considerable obscurity, for in the royal charters of the 10th and 11th centuries the word *allodium* is continually used for a fief, or hereditary benefice. "Several passages in ancient laws and instruments," says Hallam, "concur to prove that besides the relation established between lord and vassal by beneficiary grants, there was another species more personal, and more closely resembling that of patron and client in the Roman republic. This was usually called commendation, and appears to have been founded on two very general principles, both of which the distracted state of society inculcated. The weak needed the protection of the powerful; and the government needed some security for public order. Even before the invasion of the Franks, Salvian, a writer of the 5th century, mentions the custom of obtaining the protection of the great by money, and blames their rapacity, though he allows the natural reasonableness of the practice. The disadvantageous condition of the

less powerful freemen, which ended in the servitude of one part and in the feudal vassalage of another, led such as fortunately still preserved their allodial property to insure its defence by a stipulated payment of money. Such payments may be traced in extant charters, chiefly indeed of monasteries. In the case of private persons, it may be presumed that this voluntary contract was frequently changed by the stronger party into a perfect feudal dependence. From this, however, as I imagine, it probably differed, in being capable of dissolution at the inferior's pleasure, without incurring a forfeiture, as well as having no relation to land. Homage, however, seems to have been incident to commendation, as well as to vassalage. Military service was sometimes the condition of this engagement. It was the law of France, so late at least as the commencement of the third race of kings, that no man could take a part in private wars except in defence of his own lord. Indeed, there is reason to infer from the capitularies of Charles the Bald that every man was bound to attach himself to some lord, though it was the privilege of a freeman to choose his own superior. And this is strongly supported by the analogy of our Anglo-Saxon laws, where it is frequently repeated that no man should continue without a lord.—By the edict of Milan, issued by Conrad II., emperor of Germany, in 1087, four regulations are established: "that no man should be deprived of his fief, whether held of the emperor or a mesne lord, but by the laws of the empire and the judgment of his peers; that from such judgment an immediate vassal might appeal to his sovereign; that fiefs should be inherited by sons and their children, or on their failure by brothers, provided they were *feuda paterna*, such as had descended from the father; and that the lord should not alienate the fief of his vassal without his consent." This edict, though relating immediately only to Lombardy, is thought to mark the full maturity of the feudal system, and the last stage of its progress. Its object was to put an end to disagreements between inferior vassals and their immediate lords, which had been caused by the want of settled usage. Guizot is of opinion that the essential facts of the feudal system may be reduced to three, viz.: 1, the particular nature of territorial property, real, full, hereditary, and yet derived from a superior, imposing certain personal obligations on its possessor, under pain of forfeiture; in a word, wanting in that complete independence which is now its characteristic; 2, the amalgamation of sovereignty with property, the attribution to the proprietor of the soil, over all the inhabitants of that soil, of the whole or nearly the whole of those rights which constitute what we call sovereignty, and which are now possessed only by government, the public power; 3, the hierarchal system of legislative, judicial, and military institutions, which united the possessors of fiefs among themselves, and formed

them into a general society. Of feudal relations, support and fidelity were the principal. The vassal owed service to his lord, and the lord protection to his vassal. If the vassal failed in his obligation, his land was forfeited; if the lord failed, he lost his seignior. It is disputed whether the vassal was bound to follow his lord's standard against his own kindred. As respected the king, the relations were loose and shifting. There are instances of vassals aiding their immediate superiors against the king; and the royal power was always in antagonism to the feudal system.—The ceremonies which took place when a fief was conferred were principally homage, fealty, and investiture. The first expressed the submission and devotedness of the vassal toward his lord. The oath of fealty differed little in language from the act of homage, but was indispensable, was taken by ecclesiastics, but not by minors, and could be received by proxy. Investiture was the actual conveyance of feudal lands, and was proper or improper. By the first, the vassal was put in possession upon the ground, by the lord or his deputy, which the English law calls livery of seisin; by the second, possession was given symbolically, by the delivery of a branch, turf, or stone, or some other natural object, according to custom. Nearly a hundred varieties of investiture are mentioned. The vassal's duties commenced with his investiture. These were very numerous, and it is impossible to define them at large. They embraced nearly every obligation that can exist in such a state of society as then prevailed over most of Christendom. They varied, too, with place and time. Military service depended upon circumstances, though 40 days was the usual term that the tenant of a knight's fee was bound to be in the field at his own expense. Among the feudal incidents advantageous to the lord were reliefs, fines upon alienation, escheats, aid, wardship, and marriage, the two latter placing the wards and orphan minors among his vassals almost entirely at his mercy. The control of female vassals with respect to marriage was carried to its utmost extent in the Latin kingdom of Jerusalem, founded by the first crusaders at the time when the feudal system was at its height. Improper fiefs, as they were called to distinguish them from the military fiefs, were in time granted, in order to gratify pride or to raise money. "They were granted for a price, and without reference to military service. The language of the feudal law was applied by a kind of metaphor to almost every transfer of property. Hence, pensions of money and allowances of provisions, however remote from right notions of a fief, were sometimes granted under that name; and even where land was the subject of the donation, its conditions were often lucrative, often honorary, and sometimes ludicrous." Fiefs of office, too, were granted, by which persons received grants of land on condition of performing some domestic service to the lord. The mechanic arts were carried

on in the houses of the great by persons receiving lands upon these conditions.—The feudal system was exclusive in its spirit. In strictness, a person not noble by birth could not possess a fief, though there were occasional exceptions to this rule, which increased as the aristocratical spirit declined. Three descents were necessary to remove fully the stain of ignoble blood. Children born of an ignoble mother, in lawful wedlock, were looked upon as of illegitimate origin. The higher clergy, as prelates and abbots, were feudal nobles. Ecclesiastical tenants came within the scope of feudal duty. Below the gentle classes were the freemen and the serfs. The former were dwellers in chartered towns, and were destined to have an important part in destroying the feudal system; and in England, the yeomanry, to whose existence that country owed its leading place in the military system of Europe, were also among the freemen. The serfs, or villeins, were among the most abject of mankind, and were despised and maltreated because they had been degraded and injured. In some countries a distinction was made between villeins and serfs, the latter being compelled to perform the vilest labors, and thoroughly enslaved, while the condition of the former was not so harsh, their payments and duties being defined. Probably at no time in the world's history have the mass of the people been so badly treated as during the existence of the feudal system; and many of those customs and opinions that still impede the growth of the people in knowledge and happiness in several countries, are but relics of that system, and yet continue to do its work.—There were several causes for the decline of feudalism. The two extremes of society were alike interested in its destruction, and continually sought it: the king, feebly grasping a sceptre that was scarcely more than a fool's bauble; and the squalid people, who were treated by the ruling classes with less consideration than they bestowed upon beasts of chase. The growth of the institution of chivalry, which was one of the children of feudalism, was injurious to the system whence it sprung. The feudal system had much to do with the crusades, and it was probably the only state of society in which those expeditions could either have been undertaken, or have been renewed from time to time during nearly 200 years; yet they worked most injuriously to it, and helped to prepare the way for its fall. The growth of the towns, the increase of commerce, the development of the commercial spirit, the acquisition of military knowledge by the people in several countries, scientific inventions and discoveries, and the application of gunpowder to the uses of war, aided its downfall. In France it failed utterly as a bulwark against the English invasions of the 14th century, which rapidly accelerated its fate. It might have remained powerful during the first century of the Valois kings had it not proved totally unequal to the business it claimed as peculiarly its own, that of

defending the soil its members owned, and the country they governed.—See Sismondi, *Histoire des français* and *Histoire des républiques italiennes*; Guizot, *Histoire générale de la civilisation en France* and *Histoire générale de la civilisation en Europe*; Michelet, *Histoire de France*; Hallam, "Europe during the Middle Ages;" Bell, "Historical Studies of Feudalism" (London, 1852); and Lacroix, "Manners, Customs, and Dress during the Middle Ages, and during the Renaissance Period" (translated from the French, London, 1874).

FEUERBACH. I. Paul Johann Anselm, a German jurist, born in Jena, Nov. 14, 1775, died in Frankfurt, May 29, 1833. He studied law at Jena, and became professor of feudal law there in 1801, of criminal and civil law at Kiel in 1802, and at Landshut in 1804. In 1805 he was appointed to prepare a civil code for Bavaria, in 1808 became privy councillor, in 1814 a judge at Bamberg, and in 1817 president of the court of appeals at Anspach. While there he undertook to investigate the story of Kaspar Hauser, without much regard to the sovereign families thought to be compromised in the matter. He was the author of many standard law books. Of these, the *Lehrbuch des gemeinen in Deutschland gültigen peinlichen Rechts* (1801) is one of the highest authorities on the subject of criminal law in Germany. II. Ludwig Andreas, a German philosopher, son of the preceding, born in Landshut, July 28, 1804, died near Nuremberg, Sept. 12, 1872. He studied theology and philosophy at Heidelberg and Berlin, and became a tutor at the university of Erlangen in 1828, but retired into private life soon after, occupying himself solely with literary labors. In 1844 he delivered a brief course of lectures at the university of Heidelberg. He subsequently retired to a small village in Franconia, where he directed an industrial establishment, and devoted his leisure hours to literary pursuits. The latter part of his life was passed in poverty, and a subscription for his benefit was raised not long before his death. Among his works (a collection of which has been published in 10 vols., Leipsic, 1846-'66) the following are the most important: *Abälard und Heloise* (Anspach, 1833); *Geschichte der neuern Philosophie von Bacon von Verulam bis Spinoza* (1838); *Darstellung, Entwicklung und Kritik der Leibniz'schen Philosophie* (1837); *Pierre Bayle* (1838); *Das Wesen des Christenthums* (Leipsic, 1841; English translation by Mrs. Lewes, London, 1854); *Das Wesen der Religion* (2d ed., 1849); and *Gottheit, Freiheit und Unsterblichkeit* (1866). Feuerbach transformed the Hegelian doctrine into naturalism. The leading principle of his philosophy is the identification of God with the idealized essence of man, or the deified essence of nature. His own statement is: "My theory may be condensed in two words: nature and man. That being which, in my opinion, is the presupposition, the cause of existence of man, is not God—a mysterious, vague, indefinite term—but nature. On the

other hand, that being in which nature becomes conscious of itself, is man. . . . True, it follows from my theory that there is no God, that is to say, no abstract being, distinct from nature and man, which disposes of the destinies of the universe and mankind at its discretion; but this negation is only a consequence of the cognition of God's identity with the essence of nature and man."

FEUILLANTS, a branch of the order of Cistercians, founded in France in 1577 by Jean de la Barrière, abbot of the monastery of Feuillant, in the diocese of Rieux, Languedoc, for the stricter observance of the rules of St. Benedict, and declared independent by Sixtus V. in 1586. It received originally a very severe discipline, its members being obliged to go with naked head and feet, to sleep upon planks, and to eat on their knees. The rules were subsequently greatly relaxed, and the order spread over France and Italy. It was distinguished by the part which its members, especially the preacher Bernard de Montgaillard, called *Le petit Feuillant*, took in the civil wars of France in the time of the league. After having been the centre of numerous agitations, the Feuillants of France were in 1630 separated from those of Italy. Their costume was a white robe without a scapular, and a white cowl. De la Barrière founded at the same time a female order of Feuillantes, whose convent was first near Toulouse, and afterward, by invitation of Anne of Austria, in Paris. The severe discipline to which the members of this order at first subjected themselves caused the death of many of them, and was reprimanded by the pope. The order lasted till 1790.—In the French revolution a club founded by Lafayette, Sieyès, and others, at first called the company of 1789, and opposed to the Jacobins, was known as the Feuillants, from their meeting in a convent of the abolished order. In March, 1791, it was broken up by a mob.

FEUILLET, *Octave*, a French novelist and dramatist, born in St. Lô, La Manche, Aug. 11, 1812. He was educated in Paris in the college of Louis-le-Grand, and in 1845 he wrote, under the pseudonyme of Désiré Hazard, in conjunction with Paul Bocage and Albert Aubert, a romance entitled *Le grand vicillard*, published in the *National*. Since then he has written a large number of romances, comedies, dramas, and farces, nearly all of which have been received favorably. In 1862 he succeeded Scribe as a member of the French academy. He was afterward appointed librarian of the imperial residences, which position he held until the revolution of Sept. 4, 1870. Among his novels are: *Polichinelle* (1846); *Onesta* (1848); *Rédemption* (1849); *Bellah* (1850); *Le cheveu blanc* (1858); *La petite comtesse* (1856); *Le roman d'un jeune homme pauvre* (1858), which has been translated into many languages; *Histoire de Sibylle* (1862), scarcely less popular than the preceding; and *Monsieur de Camors* (1867), a story remark-

able for invention and vigor, but regarded as exceedingly demoralizing in its tendencies. His plays include *La nuit terrible* (1845), *Le bourgeois de Rome* (1846), *La crise* (1848), *Le pour et le contre* (1849), *Dalila* (1857), *Montjoye* (1863), *La belle au bois dormant* (1865), *Le cas de conscience* (1867), *Julie* (1869), and *Le Sphinx* (1874), the last the most sensational of them all. He has written also, jointly with Paul Bocage, a number of other dramas, and has published several poems.

FÉVAL, *Paul Henri Corotia*, a French novelist, born at Rennes, Nov. 23, 1817. He belongs to an old legitimist family, studied law, but became a banker's clerk, and then a writer. His *Mystères de Londres* (11 vols., 1844), somewhat in the vein of Sue and Soulié, passed through many editions, and has been translated into foreign languages. He has since published some 200 volumes, including *Les amours de Paris* (6 vols., 1845); *Le fils du diable* (12 vols., 1846); *Les belles de nuit* (8 vols., 1850); *Le bossu* (12 vols., 1858); and *Les tribunaux secrets* (8 vols., 1864). English translations of some of his novels appeared in 1870.

FEVER (Lat. *febris*, probably a transposition for *ferbia*, from *fervere*, to be hot), or **Pyrexia** (Gr. *πυρεξία*, from *πυρέσκειν*, to be feverish, derived from *πῦρ*, fire), a morbid state characterized especially, as the names denote, by an increase of the temperature of the body, generally together with acceleration of the circulation, loss of appetite, thirst, muscular debility, mental weakness, lassitude, and derangement of the functions of most of the important organs of the body. The significance of the term fever has been enhanced of late by the use of the thermometer placed either in the armpit or within some one of the outlets of the body. The thermometer shows morbid increase of the heat of the body in some cases when this is not apparent to the hand placed on the skin, and when the patient may have a sensation of coldness. During the so-called cold stage of an intermittent fever, the thermometer shows the heat of the body to be moderately raised. Fever may be said to exist whenever the heat of the body is raised above the maximum of health, namely, about 99° F. Fever is distinguished as symptomatic when it is dependent upon a local inflammation; and it is said to be idiopathic, or essential, whenever it cannot be attributed to any local cause. A symptomatic fever, as implied in the name, is only a symptom of disease; it does not constitute *per se* the disease; but an idiopathic or essential fever is reckoned as a disease. In the classification of diseases there are numerous fevers, which will be separately considered under the title **FEVERS**, excepting measles, smallpox, plague, and a few others, which are treated under their own names. In both symptomatic and idiopathic fever the increase of temperature affords not only evidence of the existence of the febrile state, but a criterion of its intensity. The fever

is intense in proportion to the increase of the heat of the body, as determined by the thermometer. The range of the morbid rise is from 99° to 110°. Moreover, the temperature both in symptomatic fever and in the fevers is a criterion of the immediate danger to life. A temperature above 105°, if persisting, always denotes great gravity, and death is imminent if the temperature remains for any length of time above that point. The increase of heat is in part due to a morbid activity in the molecular changes incident to disintegration of tissue, but our existing knowledge does not enable the pathologist to give a full explanation of the rationale of fever. At present it is an unsettled pathological question to what extent the increase of heat is causative of the various morbid phenomena which are presented in connection with symptomatic and essential fever. This question is important as bearing on the employment of drugs and other measures of treatment with a view to diminish the heat of the body. There are certain remedies which from their effect upon temperature are called antipyretics; such are quinia in full doses, digitalis, *veratrum viride*, &c. The most potent measure for diminishing temperature, however, is the employment of water externally, either in the form of the shower or plunge bath, the douche, the wet sheet, or by sponging the surface of the body. Drinking freely of cold water also has this effect. Antipyretic treatment has recently entered more largely into medical practice than formerly, from more attention having been given to the study of animal heat in different diseases by means of the thermometer.

FEVER BUSH (*benzoin odoriferum*, Nees), a shrub from 4 to 10 ft. high, with long, slender, and brittle branches, common in the northern

swampy place in the deep shade of woods. Here it produces an abundance of flowers and fruit. The flowers appear in April or May in clusters from three to six in number, are of a greenish yellow color, and come out where the last year's leaves were. The fruit is a small, oval, dark red or purple drupe, in bunches of two to five. The twigs or young branches are smooth and of a bright green, which assumes an olive tint the next year, and afterward a pearly gray. A decoction of the twigs is used to alleviate the itching from poisoning by sm-mach. According to Dr. Darlington, it is also used as a medicine for cattle in the spring. The berries have a pleasant, spicy taste, and have sometimes been used as allspice.

FEVERS, or *Pyrexia*, diseases characterized by a morbid increase of animal heat not referable to any local affection; that is, diseases in which the febrile state is idiopathic or essential. (See *FEVER*.) A fever lasting but a single day in some cases, or continuing for a few days in other cases, is called *ephemeral fever* or a *febricula*. It is without danger, as a rule, and calls for only palliative treatment. Exclusive of this form of fever, the different fevers are classified as follows: 1. Fevers characterized by periodical intermissions or marked remissions. This class is distinguished as periodical, or, from their causation, malarial fevers. Intermittent fever and remittent fever are embraced under these names, and yellow fever is generally included in this class. 2. Fevers which, in contrast with the foregoing, are characterized by a continuous febrile state, are called *continued fevers*. The fevers so classified are typhus and typhoid fever, relapsing fever, and erysipelatous fever. 3. Fevers in which an eruption on the skin is a prominent and a pretty constant feature are distinguished as *eruptive fevers*, namely, small-pox, chicken pox, scarlet fever, and measles. To this list may be added the disease known as the plague. Other diseases which are essentially fevers are not always nosologically so classified. Examples of this kind are insolation or sunstroke, cerebro-spinal meningitis, influenza, and diphtheria.

I. PERIODICAL FEVERS.—1. *Intermittent and Remittent Fevers*. The periodical fevers of malarial origin manifest this remarkable peculiarity: Intermissions or remissions recur at regular intervals, following a law of periodicity. This is especially marked in intermittent fever, called also fever and ague, chills and fever, and various other names. This law of periodicity varies, giving rise to what are known as the different types of an intermittent fever. The regular or simple types are as follows: *a*, the quotidian type, in which a paroxysm of fever recurs on each successive day; *b*, the tertian type, in which the paroxysms recur on every other or every third day; *c*, the quartan type, in which two days elapse between the paroxysms, that is, in which they recur on the fourth day, dating from the commencement of one to the commencement of

Fever Bush (*Benzoin odoriferum*).

United States, and remarkable for its graceful form and large handsome leaves, especially when it grows upon the margin of some cold,

the next paroxysm. Compound types, as they are termed, are the double quotidian, two paroxysms occurring daily; the double tertian, a paroxysm occurring daily, the paroxysms differing in certain respects on two successive days, but corresponding on alternate days; a double quartan, in which a paroxysm occurs on two successive days, and on the third day there is no paroxysm. Extremely rare varieties of type are a quintan, sextan, heptan, and octan; these names expressing the length of the intervals. The facts thus exemplifying a law of periodicity are, with our existing knowledge, inexplicable. A paroxysm of an intermittent fever, when complete, consists of three periods or stages, called generally the cold, the hot, and the sweating stage. These different stages are of variable duration, the length of the paroxysm in different cases varying from three to eight hours. The cold stage is sometimes characterized by shaking, that is, muscular tremor or rigor, and sometimes only by a sense of chilliness. This stage is sometimes wanting. The intensity of the fever varies much in different cases in the hot stage, and so the amount and continuance of the sweating which follows. If not arrested by remedies, intermittent fever tends to continue indefinitely, and is apt to induce notable anæmia or impoverishment of the blood (see CHLOROSIS), and sometimes general dropsy. Enlargement of the spleen is an occasional result of the disease. There are certain remedies which possess the power of arresting the paroxysms, and these remedies are therefore called antiperiodics. The drugs which especially have this power are the salts of quinia or quinine. (See CINCHONA.) In the vast majority of the cases of intermittent fever, the disease is promptly cured by quinine, which, given judiciously, does no harm. This drug also has a prophylactic power; that is, it prevents the occurrence of intermittent fever, and protects against relapses. Other remedies which are efficacious, but in a less degree, are salacina, bebeerina, ferrocyanide of iron or Prussian blue, strychnia, and arsenic. Remittent fever is also often controlled by quinia and other periodics.—In general, intermittent and remittent fevers are not immediately dangerous to life, even if they be allowed to continue; but they are sometimes attended with great danger, and they may cause death within a few hours. In these cases the disease is distinguished as pernicious intermittent or remittent fever. In some portions of this country it is called congestive chill. Patients affected with this fatal form may fall quickly into unconsciousness (coma), from which they do not emerge; some cases are characterized by delirium, and sometimes vomiting and purging occur, followed by a state of collapse resembling that in epidemic cholera. Pernicious intermittent or remittent fever is more apt to occur in tropical than in cold and temperate climates. Cases are

more likely to occur at certain seasons than at others; and whenever their occurrence is observed, it is immensely important to arrest the disease in every instance as speedily as possible, lest succeeding paroxysms may prove to be pernicious. If a patient pass through one paroxysm in which the symptoms threatened danger, the treatment which succeeded in preventing another paroxysm may be the means of saving life. Quinine should be given promptly and boldly under such circumstances.—The nature of the special cause of intermittent and remittent fever is unknown. Whether it be a chemical product or a living entity (animal or vegetable) is as yet a question which can only be met with reasoning and speculations. The cause is endemic in certain situations, and therefore it is of telluric origin. It is more likely to emanate from marshy situations than from those in which the soil is dry, and hence it has been called marsh miasm. It is contained in the lower strata of the atmosphere, and is present especially between sunset and sunrise. It is a very remarkable fact that the special cause may remain for a long time latent in the system; patients sometimes do not experience the disease until many months or even years after the morbid agent has entered the body. Persons who have had periodical fever are liable during many years to relapses, without any fresh exposure to the cause. Remittent fever has been called bilious remittent, or simply bilious fever; but there is no ground for referring the pathology of this fever especially to the liver, as these names would imply.—Periodical fever may be combined with continued fever, giving rise to a hybrid disease which of late years, in this country, has been called typho-malarial fever. The view generally held is that the special cause of periodical fever, as well as the special causes of all the essential fevers, produces its morbid manifestations by its presence and the changes which it occasions in the blood. The blood changes have been supposed to be analogous to those in fermentation, or those which are chemically called catalytic. The name zymotic (Gr. ζυμη, leaven) is based on this hypothesis. The diseases which are supposed to involve fermentation or catalytic changes in the blood have been nosologically distinguished as zymotic diseases. Many cogent considerations render it probable that the special causes of different fevers are living germs or entities, but their existence has not as yet been satisfactorily demonstrated.—2. *Yellow Fever*. This, although included in the class of fevers called periodical, differs essentially from intermittent and remittent fever, and is a distinct species. It has doubtless its own special cause, that is, a cause peculiar to this fever. The disease prevails only in certain portions of the globe, and is rare in any but tropical or sub-tropical regions. As a rule, in these regions it is rarely prevalent in the colder months of the year. The yellow fever zone, as it is termed, is be-

tween lat. 20° S. and 40° N. The disease prevails more in the eastern than in the western hemisphere, and in certain parts of Europe and America more than in Africa. In the western world it occurs especially in the commercial towns on the Atlantic coast south of Charleston, on the gulf of Mexico, and in the West India islands. In some seasons it prevails either as an endemic or an epidemic, and is largely destructive of human life. The mortality varies much in different seasons, the variation ranging from 10 to 75 per cent. The question as to its contagiousness has been heretofore much mooted, but at the present time comparatively few physicians regard it as communicable. The special cause, however, may be transported by means of infected vessels and merchandise, and in this way the disease is liable to be imported. Hence the disinfection of vessels coming from ports where the disease prevails, together with certain quarantine restrictions, are important. The nature of the special cause of this, as of others of the essential fevers, is unknown, but the germ theory is perhaps the most consistent with known facts relating to the history of epidemics. Facts show that the prevalence of the disease in situations where it is indigenous, and also where it has been imported, is much promoted by auxiliary causes, such as overcrowding, defective drainage or sewerage, filth, and other circumstances affecting unfavorably public health. The special cause is destroyed by a temperature of 32° F. Irrespective of the killing effect of frost, epidemics appear to have a self-limited duration, averaging a little under 60 days. Acclimation protects against the disease, the natives of yellow fever localities, and those who have been long resident therein, being rarely attacked, although they have never experienced it; and this is one of the diseases which, as a rule, are experienced but once in a lifetime, being in this respect in striking contrast to intermittent and remittent fever. In places where the disease is indigenous, it is common for it to occur sporadically during the hot seasons; that is, cases occur, but not in a sufficient number to constitute an endemic; and when persons receive into the system the special cause in a place where the disease prevails, and going to another place experience in the latter the disease, as a rule it is not disseminated. These facts show that the special cause is not generated within the bodies of those affected.—Yellow fever generally is abrupt in its attack; that is, it is preceded by few or no premonitions as a rule. It commences with a chill, which is often not of marked intensity. The fever varies in its intensity in different cases, as denoted by the temperature, the pulse, and other symptoms. Pain in the loins and limbs is usually a prominent symptom. The fever continues for a period ranging in different cases from a few hours to three days, when it either subsides notably or entirely ceases. In mild cases convalescence now ensues; and in

a certain proportion of cases the disease is mild, and not always easily discriminated from an ephemeral fever or a febricula. In grave cases the symptoms which especially denote gravity occur after this paroxysm of fever. Among these symptoms is yellowness of the skin, or jaundice, whence the name yellow fever. This, however, does not occur in all cases, being absent in very mild attacks. It denotes a certain measure of gravity, but is by no means a fatal omen. A much graver symptom is the vomiting of blood, or, as it is called, the black vomit. Cases very rarely end favorably when this symptom occurs. Hemorrhage in other situations, namely, the bowels, bladder, nose, eyes, and wounds which may exist on the skin, is an event denoting danger in proportion to the loss of blood. Suppression of urine occurs in some cases; and convulsions with coma, which sometimes occur, are probably caused by the retention in the blood of the excrementitious principles of the urine. The mode of death is generally by exhaustion. The muscular strength in some instances is preserved in a remarkable degree, patients not taking to the bed and sometimes continuing their avocations until shortly before death. These have been called "walking cases." The duration of the disease in fatal cases ranges from three to nine days, the average being less than a week.—The treatment does not embrace any specially curative remedies. Quinia and mercury have been considered as exerting a controlling influence over the disease, but at the present time no one attributes such a power to these remedies. Complete rest is highly important. Opiates and other anodyne remedies are indicated if there be great restlessness. All perturbatory and debilitating medication is injurious. Diaphoretic remedies are considered useful. Alcoholic stimulants are to be given, if tolerated, in proportion as the symptoms denote exhaustion. There is reason to believe that lives are sometimes saved by the free use of wine or spirits. Remedies to palliate vomiting, and to avert hemorrhage if this occurs, enter into the treatment. II. CONTINUED FEVERS.—3. *Typhus Fever*. Of the fevers distinguished as continued, typhus and typhoid were formerly considered identical; but the researches of Louis and later observers have established their non-identity. They are distinct species of fever, and not merely different varieties of one disease. The name typhus (Gr. *τιφος*, stupor) has reference to the stupor which is a marked feature in the majority of the cases of the fever so called. It was applied to the disease in 1759 by Sauvages. In this country the disease has been known as ship fever from the fact that it is imported in emigrant vessels. It prevails especially in Ireland. It has also been called jail fever, camp fever, petechial fever, &c. It is a contagious disease, being communicated by an impalpable emanation from the bodies of those affected with it; that is, by an infectious miasm, the nature of which is

not known. The extent of its diffusion, or what is termed the infecting distance, is not great, and it is rarely that the contagion is transported by means of clothing or other substances to which it adheres; that is, by fomites. In general, it is necessary that the miasm be concentrated, as when the emanations from a number of patients accumulate in hospital wards, or when the room in which a single patient is treated is small and ill ventilated, for the disease to be communicated, excepting to those who may be brought into close and continued contact with cases. Among nurses and physicians in the fever wards of a hospital, a considerable proportion contract the disease. A single case in a hospital ward may communicate the disease to patients lying in close proximity. It is probable that the special cause is sometimes generated in the concentrated emanations from the bodies of healthy persons congregated in overcrowded and imperfectly ventilated apartments, as in jails, camps, almshouses, and crowded ships.—In typhus, as in other fevers, the intensity of the febrile condition is denoted especially by the temperature of the body, the range in different cases varying from 102° to 107° F. The temperature in the evening, as a rule, is somewhat higher than that of the morning; and approaching convalescence is often first denoted by a fall of temperature. The frequency of the pulse is also a good criterion of the severity of the disease. In most cases there is marked stupor throughout its course. The patient often lies in apparent somnolency, and when aroused the countenance has a stupid, besotted expression. The face has a dusky hue, from the retardation of the circulation through the capillary vessels. A low muttering delirium is frequent, patients often attempting to get out of bed from some transient delusion, but being easily induced for the moment to refrain from the attempt. Active delirium requiring forcible restraint is rare. The tongue is often covered with a thick brown or black coating, and, if not prevented by the removal of the accumulations on the teeth and lips, these become covered with a dark or black material called *sordes*. Tremor of the muscles of the extremities, called *subultus tendinum*, occurs in severe cases. The bowels are usually constipated. Swelling and suppuration of the parotid glands occasionally occur. In the great majority of cases there is an eruption on the skin, the character of which serves to distinguish this fever. It appears generally on the third day after the patient takes to the bed. The distinctive characters are as follows: It is maculated, that is, consists of spots, not elevated above the surface of the skin, of a dark or dusky color, and not readily obliterated by pressure with the finger. They continue throughout the disease, and are perceptible after death. Frequently the body and limbs are thickly studded with them, but in some cases they are few in number and limited

to the trunk. This fever differs from the malarial fevers (intermittent and remittent) in being a self-limited disease. The length of its course varies between 8 and 20 days, the mean duration being about 14 days. The mortality varies considerably at different times and places, the range of variation being from 9 to 25 per cent.; the average mortality is as 1 to 5 or 6. The death rate differs according to the age of patients; it is least between 10 and 20 years, increases progressively after the age of 80, and the proportion of fatal cases is about one half after 50 years of age. A fatal termination is sometimes attributable to an important complication, as for example pneumonia; and it may be due to an antecedent disease, such as some affection of the kidneys. In general, the mode of dying is by exhaustion or asthenia.—4. *Typhoid Fever*. Although this has many symptoms in common with typhus, it differs in essential points. The name signifies resemblance to typhus. Owing to the existence of a characteristic affection of the intestines, it is called by German writers abdominal typhus, and by English and American writers, for the same reason, enteric fever. This characteristic intestinal affection is one of the essential points of distinction between typhoid and typhus fever. The affection is seated in the Peyerian and solitary glands of the small intestine. These glandular sacs become enlarged by morbid growth, softening ensues, and at length they exfoliate or slough away, leaving ulcerations in the spaces they occupied. Perforation of the intestines is an accident which sometimes occurs, the contents of the intestinal canal escaping into the peritoneal cavity; peritonitis follows as a result, terminating almost always in death. Another occasional event is hæmorrhage from the ulcers. This is sometimes profuse, and may be the cause of a fatal termination; but in the majority of the cases in which this accident occurs recovery takes place. The mesenteric glands which are in immediate relation to the Peyerian and solitary glands become considerably enlarged. If recovery from this fever takes place, the enlargement of these glands gradually disappears, and the intestinal ulcerations become cicatrized. The spleen is also constantly more or less enlarged and softened in typhoid fever. These morbid changes constitute what are called the anatomical characteristics of this disease; they are wanting in typhus fever. Typhoid fever is undoubtedly communicable; yet it is rarely communicated to those who are brought into contact with cases of it, namely, physicians, nurses, and fellow patients in hospital wards; and it occurs when it is quite impossible to attribute it to a contagium. Hence, this is a disease which, although produced in a certain proportion of cases irrespective of either a virus or an infectious miasm, may yet generate either one or both of these forms of contagious material. Facts go to show strongly that the contagium is contained in the intestinal

evacuations, and that the disease may be diffused by means of drinking water into which excrement in ever so small quantities has found access. Outbreaks of this fever have been repeatedly traced to defective waste pipes and obstructed drains or sewers. This fever is not restricted in its prevalence to any particular sections, but it is indigenous in every quarter of the globe. All ages are not alike liable to it. It is rare in infancy, but not very unfrequent in childhood, and occurs very rarely after the age of 50 years. It is more apt to prevail in the autumnal months than at other seasons. It was observed by Louis that in Paris persons who had resided there but a short time were more likely to be affected than native or older residents, and this has been observed in other cities.—In most cases typhoid fever is developed gradually. The average period from the first evidence of illness to the time of taking to the bed is about five days. The early symptoms are chilly sensations, pain in the head, loins, and limbs, lassitude, and looseness of the bowels. Bleeding from the nose is of frequent occurrence. During the course of the fever stupor, as in cases of typhus, is more or less marked. Low muttering delirium is common, and in severe cases *subultus tendinum*. The symptoms which are especially distinctive, as contrasted with typhus fever, are those referable to the intestinal affection, namely, diarrhœa, flatulent distention of the abdomen, tenderness in the iliac regions, and a sound of gurgling when pressure is made in these regions. These are known as the abdominal symptoms of typhoid fever. In the majority of cases there is a characteristic eruption, usually confined to the trunk, but sometimes extending to the limbs. The eruption, however, is rarely abundant, differing in this respect from that of typhus. It also differs in character, that of typhoid fever being papular (pimples, not spots); the color is rose red (hence called the rose papules); the redness disappears momentarily on pressure with the finger; the papules are not persistent, but come and go throughout the disease, and all appearance of the eruption disappears after death. The eruption appears later than in typhus, not being discoverable until about the seventh day from the time the patient takes to the bed. The duration of the fever is longer than that of typhus, the average, dating from the time of taking to the bed, being about 16 days in the cases which end in recovery; it is somewhat less in fatal cases. In some cases the duration is greatly protracted, and may extend to 60 days. Relapses sometimes occur, the patient during convalescence or shortly after recovery being again seized and passing through a second course of the fever. These second attacks rarely prove fatal. Convalescence is preceded by a decline in the temperature of the body (called defervescence); and frequently before a persistent reduction there are notable variations, as shown by the

thermometer, between the morning and evening temperature. The average mortality is about the same as that from typhus, 1 to 5 or 6; the rate varies much, however, at different times and places. Generally death is attributable to accidents, such as perforation of the intestine and hæmorrhage; to complications, as for example pneumonia; or to the existence of antecedent disease.—The general principles of treatment are the same in cases of typhus and typhoid fever. It is doubtful if the cause of these diseases be ever arrested, but they appear sometimes to end prematurely; abort, as it were, spontaneously. It may be said, at all events, that there are no known measures which can be relied upon for cutting short their course. The great object, therefore, is to aid in bringing them to a termination in recovery. The mineral acids have been found to diminish the rate of mortality. The use of cold water, by means of the bath, the wet pack, and sponging the surface, not only affords relief by the abstraction of heat, but clinical observation has shown that it conduces to recovery. Supporting the powers of life by a proper alimentation, and resorting to alcoholic stimulants when these powers begin to fail, constitute essential measures of treatment. Milk is preëminently the appropriate article of diet, and alcoholic stimulants are sometimes tolerated in very large quantities without any of the excitant or intoxicating effects which they would produce in health. There is reason to believe that lives are sometimes saved by the very free use of alcoholic stimulants, but it is important always to be governed in their use by the indications afforded by the symptoms. Favorable hygienic conditions are important, such as free ventilation, a proper temperature, and cleanliness. The benefit of an abundance of pure air is illustrated by the success with which these fevers have been treated in tents. In addition to the general principles of treatment, particular symptoms and events claim, of course, appropriate therapeutic measures.—As already stated in the account of periodical fevers, the special cause of these (malaria) may act in conjunction with the special cause of typhoid fever, giving rise to a combination of the symptoms of both kinds of fever, the disease being then known as typho-malarial fever. In cases of this compound fever the indications for treatment relate to the twofold causation.—5. *Spotted Fever*. This name was given to a fever which prevailed in New England, New York, and Pennsylvania from 1807 to 1815. It was considered at that time to be a form of typhus fever, and was called also *typhus petechialis*, *typhus syncopalis*, and *typhus gravior*. The name has recently by some writers been applied to the disease generally known as cerebro-spinal meningitis, or cerebro-spinal fever (see BRAIN, DISEASES OF THE), the opinion being held that the latter disease is the same as that to which the name was formerly given. The reason for the name is the

occurrence, during the progress of the disease, of dark or purple spots which are caused by small extravasations of blood in the skin. As these spots (*petechia*) occur in only a certain proportion of cases, and are present in other affections, the name spotted fever is not appropriate. Differences of opinion as to the nature and proper treatment of the disease first mentioned gave rise to a violent controversy, in reference to which see the following publications: Miner and Tully's "Essays on Fever and other Subjects" (1823); Miner, "Typhus Syncopalis" (1825); North and Strong on "Spotted Fever;" report of a committee of the Massachusetts medical society in its "Transactions," vol. ii.; Gallup on the "Epidemics of Vermont;" and Hale on the "Spotted Fever in Gardiner."—6. *Relapsing Fever*. Another of the continued fevers, now known by this name, has prevailed at different times in England, Ireland, and Scotland, but is rare on the continent of Europe. It prevailed among the English and French troops in the Crimea during the war with Russia. In this country it never prevailed to any extent prior to the winter of 1869-'70, during which and the following summer it existed as an epidemic in New York and other large cities. The disease was evidently imported by foreign immigrants. It is undoubtedly a contagious disease, but not highly so; considerable exposure seems to be required. The infecting distance is restricted to a limited area, and it is not certain that the contagium is transported by means of fomites. The prevalence of the disease is aided much by cooperating causes, namely, destitution, deprivation, and deficient alimentation. From the apparent influence of the latter, the disease has been called "famine fever" and "hunger pest." It is developed abruptly, and usually commences with a well pronounced chill, which is at once followed by more or less increase of the heat of the body, with frequency of the pulse, and the usual concomitants of the febrile state. Frequently the patient perspires freely soon after the commencement of the fever. In most cases the fever is intense, the thermometer in the armpit showing a temperature frequently from 103° to 105°, continuing with but little fluctuation until the paroxysm ends; that is, for a period varying, in the great majority of cases, from five to seven days. Exceptionally the duration of this paroxysm is as brief as two, or as long as twelve, days. The febrile state subsides abruptly at the end of the paroxysm, when the temperature, together with the pulse, sometimes falls below the standard of health, returning to this standard after a day or two. The patient remains free from fever for a period varying from two to twelve days, the average duration being about seven days. Then occurs another paroxysm of fever, the intensity of which is sometimes greater and sometimes less than that of the primary one.

This relapsing paroxysm varies usually from three to five days, exceptionally lasting only a single day, or extending even to ten days. The relapse is occasionally wanting, and in rare cases a third, a fourth, or even a fifth relapse has been observed. During the paroxysm nausea and vomiting are apt to be more or less prominent as symptoms. Sometimes blood is vomited, and hence, among a variety of names, the disease has heretofore been called mild yellow fever. Jaundice occurs in a small proportion of cases. Pain in the joints and in the muscles of the loins and limbs is usually a marked feature of this fever. Delirium rarely occurs. There is no characteristic eruption. Important complications are of very unfrequent occurrence. The mortality from this disease is slight, varying in different collections of cases from 2 to 4 per cent. In the fatal cases the death is sometimes due to complications or antecedent diseases; but instances of sudden death from syncope have been repeatedly observed, and also from coma and convulsions following suppression of the urine. Persons who have experienced the disease are not exempt from subsequent attacks. The fever cannot be cut short by any known means. The first consideration in the treatment is the temperature. Relief is obtained by the direct abstraction of heat through baths, the wet pack or sponging, and by antipyretic remedies. The palliation of the muscular and arthritic pain is the next object of treatment, requiring the use of opiates. Further indications relate to the kidneys, if their action be deficient, and to alimentation. The dietetic management, especially when the patient has been insufficiently nourished, is highly important; and, as in the treatment of other fevers, milk should constitute the basis of the diet.—7. *Epidemic Erysipelas*. A fever called epidemic erysipelatous fever, or epidemic erysipelas, and popularly known in some parts of the country by the name of black tongue, prevailed extensively in the New England and the middle, western, and southern states, from 1841 to 1846. Erysipelas often occurred during the course of the disease, but not in the majority of cases; it appeared in different situations, was more or less extensive, and was apt to lead to suppuration, gangrene, and sloughing. Inflammation of the throat (pharyngitis) was a very constant local affection. The disease was not unfrequently complicated with inflammation of serous membranes (pleuritis, peritonitis, and meningitis), and with pneumonia. Suppuration of the glands of the neck was not uncommon. The mortality was large, owing to the complications just named. Laryngitis and oedema of the glottis were other complications leading to a fatal result. Irrespective of the danger connected with the local affections, the disease was mild, running its course in five or six days. Bleeding and other so-called antiphlogistic measures of treatment appeared to be hurtful. Tonic and supporting measures

fulfilled better the therapeutical indications. It was observed that in places where the disease prevailed cases of puerperal fever were also prevalent. It was the general opinion among physicians that the fever was communicable.—A fever accompanied by pharyngitis or inflammation of the throat prevailed in the winter and spring of 1857 in the western part of the state of New York, in the adjacent parts of Pennsylvania, and in Canada. Its usual duration was from three to six days, and it terminated uniformly in recovery. A similar fever prevailed in 1866 among the United States troops stationed at Hart's island, in Long Island sound. It is probable that this fever has occurred at other times and places without having been described by medical writers. The disease as yet has no name. It differs from acute pharyngitis in that it is manifestly an essential fever; that is, the febrile state is not symptomatic of the local affection, but the latter is secondary to or a complication of the fever. It is analogous to the epidemic erysipelatous fever in the constancy of the pharyngeal affection. III. ERUPTIVE FEVERS.—8. *Scarlet Fever, or Scarlatina*. This is distinguished from other eruptive fevers by the fact of the eruption being an exanthema, an efflorescence, or a rash, these terms not being strictly applicable to vesicles and pustules. The disease sometimes commences with a chill, and in most cases vomiting is a primary symptom, especially in children. The fever which at once occurs is usually intense, the axillary temperature often rising to 105°, or even higher. The pulse in general is correspondingly frequent. The surface of the body often gives to the touch a burning sensation. The rash appears in about 24 hours after the date of the invasion, and with very few exceptions breaks out first on the face and neck, being diffused over the body in the course of 24 hours. The color of the rash is scarlet, whence the name. The rash in some cases is equally diffused over the whole skin, giving rise to an appearance like that of a boiled lobster. In other cases it is limited to patches varying in number and size, with irregular or serrated margins. The skin is somewhat swollen, and the rash occasions a burning sensation, with in some cases intense itching. Very generally the eruption takes place in the throat, more or less redness being apparent here, simultaneously with or before the appearance of the rash on the skin. Generally with the redness there is more or less swelling of the tonsils. Some cases are characterized by severe inflammation of the throat, accompanied by either an ash-colored product or an exudation resembling that which takes place in diphtheria; and with this affection of the throat the glands of the neck become inflamed and sometimes suppurate. When the throat affection is severe the disease has been called *scarlatina anginosa*. The inflammation in some rare cases extends from the throat into the middle ear, giving rise

to perforation of the tympanum, with perhaps loss of the ossicles, and resulting in more or less impairment of the sense of hearing. The cutaneous eruption continues from four to six days. Then follows the stage of desquamation. The cuticle generally in this stage exfoliates, and is separated either in the form of branny scales, or in large flakes or patches. In some instances the cuticle of the hands is separated intact, and may be stripped off like a glove. The itching in this stage is sometimes extremely annoying. In favorable cases the duration of this stage may be reckoned to be five or six days, when convalescence is established. Frequently, however, this stage is much protracted. Aside from variations in respect of gravity and danger incident to the throat affection, scarlet fever differs greatly in the intensity of the fever and constitutional symptoms. The disease in a certain proportion of cases is extremely mild, the patient perhaps not being confined to the bed. In other cases it is extremely severe, and it may prove fatal within a few days or even hours. In no other disease are the two extremes more widely separated. Death sometimes takes place before the eruption appears. An affection of the kidneys, namely, inflammation of the membrane lining the uriniferous tubes (desquamative or tubal nephritis), is occasionally a concomitant, but oftener a sequel, of scarlet fever. This local affection may interfere with the excretory function of the kidneys so as to occasion retention of urinary principles in the blood, constituting the morbid condition called uræmia; and this condition may prove serious, giving rise to coma and convulsions. Occurring as a sequel of scarlet fever, this affection of the kidneys leads to general droopy. From this the patient recovers, provided fatal effects of uræmia do not take place. Scarlet fever is highly contagious, and it may be communicated by means of fomites. The infectious material remains for a long time in garments, &c., preserving its power of producing the disease. The time which elapses from the reception of the infection before the manifestation of the disease, that is, the period of incubation, is short, sometimes not more than 24 hours, and rarely exceeding a week. As a rule the disease is experienced but once, but exceptions are not very rare. Children are much more susceptible to the special cause than adults. After 40 years of age the susceptibility generally ceases. Children under two years rarely contract the disease.—The treatment in mild cases of scarlet fever is very simple. Active medication is not indicated. It suffices to diminish the animal heat by sponging the body and giving cooling drinks, with such palliative remedies as particular symptoms may denote, observing proper hygienic precautions. In severe cases the use of the cold bath or the wet pack is highly beneficial, not merely as affording relief but diminishing danger. The value in this disease of the direct abstraction of heat by these means

has been very fully established by clinical experience. Inunction of the surface of the trunk and limbs with fat bacon or some oleaginous preparation allays the itching, which is often very distressing, and in the opinion of some the severity of the disease is thereby much lessened. As in other diseases, whenever the symptoms show failure of the vital powers, supporting measures of treatment (alcoholic stimulants and alimentation) are indicated. There are no known remedies which exert a specific control over this disease, more than over the continued and the other eruptive fevers. Care during convalescence in scarlet fever is considered as especially important with reference to the liability to the affection of the kidneys already referred to. This care relates particularly to exposure to cold; and a fact important to be borne in mind is, that this affection of the kidneys as often follows mild as severe cases of scarlet fever. Belladonna has been supposed to afford protection against this disease after exposure to the infection. This is not certain. Complete protection can be secured only by avoiding the infection through contact or proximity to patients, and disinfecting everything which may convey it.—For the other eruptive fevers, see CHICKEN POX, SMALL-POX, MEASLES, and PLAGUE.

FEYDEAU, Ernest Aimé, a French author, born in Paris, March 16, 1821, died there, Oct. 28, 1873. He published a volume of poetry in 1844, and acquired notoriety in 1858 by his questionable novel *Fanny*. His subsequent works of a similar kind were not as popular; nor was he successful as a playwright. He was connected with various journals, and his miscellaneous writings include *Histoire générale des usages funèbres et des sépultures des peuples anciens* (3 vols., 1858); *Le secret du bonheur*, sketches of Algerian life (2 vols., 1864; English translation, 2 vols., 1867); and *L'Allemagne en 1871* (Paris, 1872).

FEYJÓO Y MONTENEGRO, Francisco Benito Jerónimo, a Spanish reformer, born probably at Cardamiro, Oct. 8, 1676, died in Oviedo, May 16, 1764. He was a Benedictine monk, and became professor of divinity at Oviedo, abbot, and eventually general of the Benedictine order. He resided the greater part of his life in the monastery at Oviedo, devoted to literary, philosophical, and scientific labors. He opposed the philosophical system then taught in Spain, maintaining Bacon's principle of induction in the physical sciences, and ridiculing the prevailing fallacies in regard to astronomy and astrology. He published his dissertations under the title of *Teatro crítico universal, ó discursos varios en todo género de materias, para desengaño de errores comunes* (1736-'42), and continued them under the title of *Cartas eruditus* (1742-'60). His works have gone through many editions, and selections from them were translated into French by D'Hermilly (Paris, 1745), and into English by John Brett (London, 1770-'80).

FEZ (Ar. Fas). I. A province of Morocco, occupying the N. portion of the empire, bounded N. by the Mediterranean, E. by Algeria, and W. by the Atlantic. It is traversed in the east and south by branches of the Atlas mountains, but the western portions form a rich champaign country, productive in grain, chiefly wheat and barley, honey, tobacco, olives, and wine. The chief river is the Sebou, which, rising in the E. part of the province near the Atlas mountain, passes within 6 m. of the city of Fez, and enters the Atlantic at Mamora, where it is navigable. The chief cities are Fez and Tangier, the principal commercial seats of the empire, Mequinez, Tetuan, El-Araish, Salee, Rabat, and Kasr el-Kebir. The Spanish presidios of Ceuta, Alhucemas, Señor de Velez, and Melilla are in this province, on the Mediterranean. Fez formed a part of Mauritania Tingitana under the Romans. Early in the 5th century the Vandals settled here, and remained until the conquest of N. W. Africa by the Arabs. It was subject successively to the eastern caliphs and the Ommiyades of Spain, and was afterward an independent kingdom till conquered and annexed to Morocco about 1548. II. A city, capital of the province, in lat. 34° 6' N., lon. 5° 1' W., about 85 m. from the Mediterranean, and 90 m. from the Atlantic; pop. estimated at 88,000, including 65,000 Moors and Arabs, 10,000 Berbers, 9,000 Jews, and 4,000 negroes. It is situated on the slope of a valley watered by a small affluent of the Sebou, which divides within the city into two branches, supplying the baths and fountains. The city, surrounded by dilapidated walls, is 4 m. in circuit, and is divided into the old and new towns, both, however, ancient, and both composed of narrow, dirty streets. The houses are of brick, with galleries and flat roofs. It is one of the three residences of the emperor, but the palace, although large, is not remarkable. In the 16th century this place was a famous seat of Arabic learning. It has yet a university called the house of science, colleges, and elementary schools. Formerly the city contained some hundreds of mosques, and is said still to have 100, of which the principal are El-Karubin and the mosque of Sultan Muley Edris, founder of the city (in the 9th century). The former has a covered court for women to pray in, and the latter, which contains the remains of the founder, is a sanctuary for criminals. From its abundance of mosques and relics Fez is a holy city to the western Arabs. It possesses 200 caravansaries, some hospitals, and manufactories of woollens, sashes, silk stuffs and girdles, the red woollen caps called fez (dyed of a bright red color by means of a berry found in the vicinity), slippers, coarse linens, fine carpets, saddlery, arms, &c. Of the fine leather known by the name of morocco, the red comes from Fez. Its artisans are very skilful in goldsmith's work and jewelry. It is the depot of the inland trade, and collects for export gums,

spices, ostrich feathers, ivory, &c. Caravans set out from the city semi-annually, in March and October, across the desert for Timbuctoo. They complete the round journey in 189 days, of which only 54 are employed in actual travel.

FEZZAN (anc. *Phazania*, and the land of the Garamantes), an inland country of N. Africa, supposed to extend from about lat. 23° to 31° N., and from lon. 12° to 18° E., but the boundaries are ill defined; pop. about 50,000. It lies south of the pashalic of Tripoli, to which it is tributary, and is bounded on all other sides by the Sahara. In consequence of the want of moisture, and the great heat, it is almost barren of vegetation. The soil consists of black shining sandstone, or the fine sand of the desert, gypsum, and rock salt, with strata of dolomite and limestone. The valleys intersecting the low ranges of hills contain the cultivable land of the region. Its northern parts are traversed by two ridges of stony and sandy hills, which in some places attain an elevation of 1,200 ft. from their base. In the eastern district they are called El-Haruj, but in the west take the name of the Ghurian and Soodah mountains. S. of the Soodah extends the salt-incrusted desert of Ben Afen. The table land of Moorzook occupies the middle and southern parts of the country. The land lies in a hollow lower than the surrounding desert. The heat in summer is intense, rising sometimes to 188° F. In winter the cold is greater than might be anticipated from its latitude; in 1850 snow fell at Sokna, and ice as thick as a man's finger was found at Moorzook. There are no rivers or brooks, rain seldom falls, thunder storms are rare, and the climate is very unhealthy for Europeans. Dates are the staple product; small quantities of maize and barley are raised. Among the other productions are figs, pomegranates, watermelons, legumes, durra, and a little wheat. Of domestic animals, goats are the most numerous; camels, horses, and asses are reared. Of wild animals, there are the lion, leopard, hyæna, jackal, buffalo, fox, and porcupine; among birds, vultures, falcons, and other birds of prey, with ostriches and bustards. Fezzan is exempt from flies, but ants, scorpions, and bugs abound. Planted on the high road of commerce between the coast of Africa and the interior, the inhabitants place their main reliance upon the caravan trade. From Cairo to Moorzook the caravan takes about 40 days, from Tripoli to the same place about 25 days. Of manufactures, besides a little leather and articles in iron, the country is almost destitute. Fezzan is inhabited by two branches of the Berber race: the Tuarika, who occupy the northwest, and the Tibboos, who dwell in the southeast. Their complexion is dark brown, and their persons are well formed. They speak a corrupt dialect of Arabic and Berber. Their writing is in the Mograbin characters, but they have little idea of arithmetic, and reckon everything by dots in the sand, ten in

a line. Their media of exchange are Spanish coin and grain. The country is ruled by a sultan, who resides at Moorzook. The chief sources of his revenue are taxes upon slaves and merchandise. The only places exhibiting prosperity, according to Barth, are Moorzook and Sokna; the population of each is estimated at about 8,000.—L. Cornelius Balbus the younger, Roman proconsul of Africa, penetrated into Phazania about 20 B. C. The remains of Roman civilization, in the shape of columns or mausoleums, are still found as far S. as $26^{\circ} 25'$. In the 7th century Fezzan fell under the dominion of the Arabs, who introduced Mohammedanism, to which religion the people are still fanatically attached. Since then Fezzan has generally been tributary to some Arab potentate. In 1811 the bey Mukni usurped the throne and acknowledged allegiance to the pasha of Tripoli. Fezzan has been much visited by modern travellers, and is regarded as the starting point for the interior of Negroland. Denham and Clapperton, Oudney, Hornemann, Lyon, Ritchie, Barth, Richardson, and lastly Dr. Vogel, have all visited and described it.

FIARD, Jean Baptiste, abbé, a French ecclesiastic, born in Dijon, Nov. 28, 1786, died there, Sept. 30, 1818. He accounted for the perversities of human conduct by ascribing them to demoniac agency. It was his opinion that Voltaire and other philosophers of his time were merely demons, and he denounced them as such before an assembly of the clergy of France in 1775. The French revolution seemed to him a great diabolic triumph, and his opinion was confirmed by his own imprisonment for two years for persistence in the exercise of the priesthood. Among his writings are *Lettres philosophiques sur la magie* (Dijon, 1808), and *La France trompée par les magiciens et démonolâtres du 18^e siècle, fait démontré par des faits* (Dijon, 1808).

FIBRINE, a nitrogenous organic substance, existing in a fluid form in the blood and lymph, and capable of spontaneous coagulation when withdrawn from the vessels of the living body. Vegetable fibrine, a substance analogous to it in composition, is found in the newly expressed juices of plants, particularly of the grape, when these are allowed to stand for some time, and the gelatinous substance that is deposited is washed free from the coloring matter associated with it. A similar substance exists also in wheat flour, being separated in the gluten. Fibrine is obtained from freshly drawn blood by taking up theropy portions that adhere to a twig with which it is stirred, and thoroughly cleansing these of coloring and soluble matters by washing. It is a soft white substance, and becomes on drying yellowish, brittle, and semi-transparent. Numerous analyses have been made of the fibrine, albumen, and caseine derived from vegetables used for food—the albumen from the clarified juice of turnips, asparagus, &c., and the caseine from beans and peas; and the results prove a close

analogy of composition not only among themselves, but with the chief constituents of the blood, animal fibre and albumen. One of the analyses of animal fibrine by Sherer might almost equally well be given for either of the other substances, or indeed for the caseine of milk, which is a similar substance. The following is one of many quoted by Liebig: carbon, 54.454; hydrogen, 7.069; nitrogen, 15.762; oxygen, sulphur, phosphorus, 22.715. Fibrine is exceedingly important as an ingredient of the blood, since it is due to its presence alone that the blood is capable of coagulating in wounds or after the ligature of blood vessels, and thus arresting the hæmorrhage which would otherwise continue to take place. Its proportion in the blood is rather over two parts per thousand, in the lymph about one part per thousand.

FICHTE. I. Johann Gottlieb, a German philosopher, born at Rammenau in Lusatia, May 19, 1762, died in Berlin, Jan. 27, 1814. He was the son of a poor weaver, and owed his education to a wealthy nobleman, the baron of Miltitz. He studied theology at Jena, Leipzig, and Wittenberg, 1780-'83, and for ten years obtained a precarious living as a private tutor. While at Königsberg in 1791 he became acquainted with Kant, of whom he had been one of the earliest and most enthusiastic admirers, and as an application of his philosophy wrote a pamphlet entitled *Kritik aller Offenbarungen* ("Review of all Revelations"), which, published anonymously, was generally believed to have been written by Kant himself. In 1798, while residing in Switzerland, he published a work in two volumes "to rectify public opinion in regard to the French revolution." In 1794 he obtained a professorship of philosophy at the university of Jena through the influence of Goethe, then secretary of state of Saxe-Weimar. Here he commenced a series of lectures on the science of knowledge (*Wissenschaftslehre*), and gave also a course of Sunday lectures on the literary calling. In the same year he published a treatise containing the fundamental doctrines of his philosophical system, *Ueber den Begriff der Wissenschaftslehre*, and during the next five years his system was matured and completed. By it he immediately took rank among the most original of living philosophers, and as it appeared to furnish a metaphysical basis for progressive political and religious views, he was considered one of the leaders of the liberal party in Germany. In conjunction with Niehammer he also published a philosophical journal, in which were inserted articles containing certain views which were considered by many as tending directly to atheism. The grand-ducal government, alarmed at the boldness of his theories, insisted on his removal, and Goethe, though secretly sympathizing with him, felt bound to express his official disapprobation. Fichte resigned his professorship and appealed to the public in a pamphlet entitled *Appellation gegen die An-*

klage des Atheismus, which, though proving his deep earnestness, could scarcely be considered a conclusive refutation of the objections raised against his doctrines. He maintained in it that science could conceive the idea of existence only in regard to such beings or things as belonged to the province of sensual perception, and that therefore it could not be applied to God. God was not an individual being, but merely a manifestation of supreme laws, the logical order of events, the *ordo ordinans* of the universe. He said it was no less ridiculous to ask a philosopher if his doctrines were atheistic than to ask a mathematician whether a triangle was green or red. From Jena Fichte went to Berlin, where by his writings and lectures he exerted a great influence on public opinion, and after the reverses which befell the Prussian monarchy (1806) became one of the most conspicuous and powerful anti-Napoleonic agitators. For a few months only (1805) he accepted a professorship at the university of Erlangen, where he delivered his celebrated lectures *Ueber das Wesen des Gelehrten*. While the French conquerors were still in Berlin he delivered in the academy his *Reden an die deutsche Nation*, which are admired as a monument of the most intense patriotism and depth of thought. Immediately after the establishment of the Berlin university in 1810, he accepted a professorship there. In 1818 he resumed his political activity with great success. When at last the deliverance of Germany from French oppression had given him sufficient tranquillity of mind to resume the completion of his philosophical system, he fell a victim to the noble exertions of his wife in the cause of charity. By nursing the sick and wounded in the military hospitals for five months she had become infected with typhus. She recovered, but her husband, who had also taken the disease, succumbed to it. Besides the above mentioned publications, the following are Fichte's principal works: *Grundlage der gesamten Wissenschaftslehre* (1794); *Grundlage des Naturrechts* (1796-'7); *System der Sittenlehre* (1798); *Ueber die Bestimmung des Menschen* (1801); *Anweisung zum seligen Leben* (1806). His complete works were published at Berlin in 1845.—To give a succinct and intelligible analysis of Fichte's philosophical system is next to impossible. His language is abstruse and liable to misconstruction, to which indeed Fichte's philosophy has been subject in a higher degree perhaps than that of any other modern philosopher. Thus, for instance, to designate the self-conscious intellect as contrasted with the non-conscious objects of its conception, he uses the personal pronoun "I" as contrasted to the "not I" (*Ich* and *Nicht-Ich*, in English versions generally rendered by the Latin *ego* and *non-ego*); and this was misconstrued by many of his contemporaries as a deification of his own individual self, while in point of fact he meant only that which by other moderns has been called

the absolute, and by the ancient philosophers the substance. Fichte's philosophy was intended to amplify that of Kant. Kant, in investigating the theory of human cognition, had arrived at the conclusion that the properties of external objects, by which they are discerned and known, are not realities, transferred from without into the human mind, but mere forms of conception innate in the mind. Hence he argued that objects *per se*, or such as they really are, independent of human cognition, are utterly unknown to man. So far as man is concerned, they are only phenomena; that is to say, for man they exist only as they appear to the mind according to its forms of conception (categories), while as *noumena*, or such as they are *per se*, they are unknown and inconceivable. What Fichte attempts to prove is simply this: that between objects as they appear to human conception and as they actually are there is no real difference, since the forms of human cognition are identical with the action of the absolute intellect; that objects are the limit set by the absolute within itself in order to arrive at perfect self-consciousness; that the absolute (the *Ich*) is at the same time subject and object, the ideal and the real. Reduced to plainer language, all this would mean that God (the absolute subject, the great active and creative "I") and nature (the "not I," the aggregate of objects) are united in a similar manner as soul and body; that the absolute intellect pervades all and everything, and that the human mind is an integral part of the absolute intellect. But, clothed in the most singular and obscure formulas, the theory of Fichte was understood by many to mean that all reality existed only in the imagination of man, and was in fact merely an outward reflection or manifestation of the workings of the human mind. Such was not his idea, and the term "idealist," when applied to Fichte, has a different meaning from that in which it is applied to Berkeley. That the ultimate consequences of Fichte's system would have led him into a sort of pantheistical mysticism is apparent from his later writings, in which the "I" is much more clearly than in his earlier works set forth as God, and all individual minds only as reflections of the absolute. Applying his metaphysical theories to ethics, Fichte concludes that morality consists in the harmony of man's thoughts (conscience) and actions. Entire freedom of action and self-determination is, according to Fichte, not merely the preliminary condition of morality, but morality itself. Hence law should be nothing more than a determination of the boundaries within which the free action of the individual must be confined; so as to concede the same freedom to others. Law has no meaning or existence without society. The object of society is the realization of the supreme law as conceived by human reason. The most perfect state of human society would be the true kingdom of heaven, since the absolute or God is

revealed in the rational development of mankind. It is easily seen how these ethical doctrines of Fichte appeared in practice. Maintaining that self-reliance and self-determination were the only guarantees of true morality, and contending against the assumption of the divine right of political institutions, he furnished a philosophical basis to the liberal political parties who opposed the sanctity of popular rights to the assumed divine right of monarchs. In order to insure to the people the greatest possible amount of rational well being, Fichte taught that the introduction of the most universal popular education was one of the principal duties of the state. In regard to this subject his urgent appeals to the German governments were highly successful. The identity of the subject and object, or of the ideal and real, as taught by Fichte, became the basis as well of Schelling's nature-philosophy as of Hegel's philosophical system, the former of which attempts a logical construction of the universe from the standpoint of the object (nature), while the other attempts the same from the point of view of the subject (the human mind).—The *Grundsätze des gegenwärtigen Zeitalters* ("Characteristics of the Present Age"), *Wesen des Gelehrten* ("Nature of the Scholar"), *Bestimmung des Menschen* ("Vocation of Man"), *Bestimmung des Gelehrten* ("Vocation of the Scholar"), and some others of Fichte's works, have been translated into English by William Smith (with a memoir, London, 1845-'8). Other translations from Fichte, by A. E. Kroeger, are, "New Exposition of the Science of Knowledge" (St. Louis, 1869), and "The Science of Knowledge" (Philadelphia, 1870). II. Immanuel Hermann, son of the preceding, born at Jena in 1797. From 1822 to 1842 he filled professorships at Saarbrück, Düsseldorf, and Bonn, and since 1842 has been professor of philosophy at the university of Tübingen. He has published many philosophical works, mostly following the theories of his father, though he claims to have established a system of his own, which, in contradistinction to the Hegelian pantheism, he calls concrete theism. Among his works are: *Sätze zur Vorschule der Theologie* (1826); *Die Ontologie* (1836); *Die speculative Theologie* (1846-'7); *System der Ethik* (1850-'58); *Anthropologie* (1856); and *Psychologie als Lehre vom bewussten Geiste des Menschen* (1864 et seq.). He has also published the literary correspondence of his father, with a biography (1830). He founded at Bonn the *Zeitschrift für Philosophie und speculative Theologie*, which he conducted from 1837 to 1848, and which has been continued by Ulrich and Wirth.

FICHELGEIRGE (Pine mountains), a chain of mountains in Bavaria, province of Upper Franconia, between the Bohemian Forest and the Franconian Jura, covered with forests of firs and pines. By reason of its position in the centre of Germany this chain is regarded as the nucleus of all the Germanic mountains,

though it does not surpass the neighboring chains in elevation. It separates the affluents of the North and Black seas, the river Naab descending from it on the south, the Saale on the north, the Eger on the east, and the Main on the west. It extends in length 80 m. N. E. from Baireuth to the Bohemian frontier, and its two loftiest summits are the Schneeberg (Snow mountain) and the Ochsenkopf (Ox Head), respectively 3,484 and 3,866 ft. high. The Fichtelgebirge possess a robust and laborious population. The upper part of the mountains yields oats and wood in abundance, and the lower parts produce rye, barley, flax, pulse, and a little wheat; but the chief industry of the inhabitants is in working the numerous mines of iron, vitriol, sulphur, lead, copper, and marble. The mountains are densely populated and traversed by good roads, and in the northwest by the Saxon-Bavarian railway.

FICINO, Marsilio, a Platonic philosopher of the 15th century, born in Florence, Oct. 19, 1483, died at Careggi, Oct. 1, 1499. He was the son of the first physician of Cosmo de' Medici, and was intended for his father's profession. The Greek Gemistus Pletho, an enthusiastic student of the philosophy of Plato, inspired Cosmo with the design of naturalizing this philosophy in Italy. He selected Ficino, as a youth of great promise, to be instructed in the mysteries of Platonism, and to become the chief and preceptor of a new Platonic academy. He educated him in his palace, surrounded him with Greek masters, encouraged him to read the philosophers of antiquity, placed him when 30 years old at the head of the academy of Florence, and charged him to be the interpreter and propagator of the Platonic philosophy in the West. Ficino made numerous translations from Plato, Iamblichus, Hermes Trismegistus, whom he especially admired, and from most of the Alexandrian philosophers. He was appointed by Cosmo president of a literary society which assembled at his house, and had for its object to explain the doctrines of Plato. At the age of 40 he entered the church, and was appointed a canon in the cathedral of Florence. He became the disciple of all schools, and borrowed from all systems. He treated of the nature and immortality of the soul, the functions and distinguishing characters of angels, and the being and attributes of God. His chief merit, however, is as the translator and first western admirer of Plato; and in his partiality for this philosopher he is said to have endeavored to introduce fragments from his writings into the offices of the church. His works were collected and published at Basel (2 vols. folio, 1491).

FICK, Adolf, a German physiologist, born in Cassel in 1829. He received his diploma of M. D. at Zürich in 1852, and was professor of physiology there from 1856 till 1868, and has since filled the same chair at Würzburg. He has published *Die medicinische Physik* (Brunswick, 1857), as a supplementary volume to Müller's

version of Pouillet's *Éléments de physique*. His other writings include *Compendium der Physiologie des Menschen mit Einschluss der Entwicklungsgeschichte* (1860), *Anatomie und Physiologie* (1862), and *Die Naturkräfte in ihrer Wechselbeziehung* (1869).

FICQUELMONT, Karl Ludwig, count, an Austrian general and statesman, born at Dienze, Lorraine, March 28, 1777, died in Venice, April 7, 1857. He was a son of Count Joseph, who, after emigrating from Lorraine to Austria, died in 1799 from a wound received at the battle of Magnano. He entered the Austrian army, and in 1809 was colonel and chief of the staff of the grand duke Ferdinand of Este. In 1811 and 1812 he commanded three regiments of cavalry in Spain under Wellington. In 1813 he was promoted to the rank of major general, and in 1814 he brought about the capitulation of Lyons. He was afterward sent on several important diplomatic missions. He was minister of foreign affairs during Metternich's temporary absence from Vienna in 1839, and in 1840 became a member of the cabinet. During the revolution of 1848 he was for a short time minister of foreign affairs, and then provisional prime minister, till May 4, when he retired on account of a hostile demonstration of the people, who looked upon him as a disciple of Metternich; but he continued to exercise important influence in the affairs of the empire. He wrote several political pamphlets, some of which, as *Lord Palmerston, England und der Continent* (Vienna, 1852), and *Zum künftigen Frieden* (1856), attracted considerable attention. *Les pensées et réflexions morales et politiques du comte de Ficquelmont* appeared in Paris in 1869, with a biographical notice by M. de Barante.

FICTION, in law, a supposition which is known not to be true, but which is assumed to be true in order that certain conclusions and inferences may be supported. Fictions have been made use of in all legal systems, but in none more abundantly than in that of England. The important courts of queen's bench and exchequer acquired their general jurisdiction by means of the fiction of supposing in the one case a trespass and in the other a debt to the crown, which the defendant was not suffered to dispute. The old action of ejectment and the existing action of trover furnish cases of fictions which seem to us at this day utterly absurd, the supposed lease, entry, and ouster in the one case, and the supposed finding of the goods in dispute in the other, having no bearing on the merits of the case; but they nevertheless have had their use in enabling the courts to give suitable remedy for a wrong which otherwise might have gone unredressed in some cases. With few exceptions, no fictions are now retained in the law except such as have a beneficial purpose; and these are mostly fictions of relation, as where the title of an administrator is supposed to have attached at the death of the deceased, in order to enable him

to recover for any trespass or misuse of the property prior to his appointment; and that of a purchaser at a judicial sale is made to relate back to the time of sale, though the title is not to pass until after the expiration of a period allowed for redemption. Several rules are laid down in respect to fictions: 1. The law never adopts them except from necessity and to avoid a wrong. 2. They must not be of a thing impossible. 3. They are never admitted where the truth will work as well. 4. They are not admissible in criminal trials. The fiction, for instance, that the title of a purchaser at a judicial sale shall relate back and cover the period allowed for redemption, though admissible for the purpose of giving a remedy against a wrong doer, would not be admissible as against the party whose previous title was divested, if by law he was entitled to a beneficial use of the property until the time for redemption expired. Fictions might undoubtedly be all rendered unnecessary by statutory provisions, but not many are made use of in the law at this time which create any confusion, or the removal of which could be of any service beyond giving a little more directness to legal proceedings, or expressing the legal right in language more suited to the comprehension of laymen.

FIELD. I. David Dudley, an American clergyman, born at East Guilford, Conn., May 20, 1781, died at Stockbridge, Mass., April 15, 1867. He graduated at Yale college in 1802, was minister at Haddam, Conn., from 1804 to 1818, at Stockbridge, Mass., from 1819 to 1837, and again at Haddam from 1837 to 1851, when he returned to Stockbridge. He published "History of Berkshire County" (1829), "History of Middlesex County" (1839), "History of Pittsfield" (1844), "Genealogy of the Brainerd Family" (1857), and several occasional sermons. **II. David Dudley**, an American jurist, eldest son of the preceding, born at Haddam, Conn., Feb. 13, 1805. When he was 14 his father removed to Stockbridge, Mass., and in 1821 he entered Williams college. In 1825 he commenced the study of law, was admitted to practice in 1828, and settled in New York, where he has been conspicuous at the bar for more than 40 years. He is especially known by his labors in the cause of law reform. As early as 1839 he published his first essay on the subject, pointing out the necessity of a reconstruction of the modes of legal procedure. This he followed up by other articles on the same subject in 1842, 1844, 1846, and 1847. In 1847 he was appointed by the legislature of New York a commissioner on practice and pleadings, and as such took the leading part in the preparation of the code of procedure. Of this work only a part has been enacted into law, and many, if not all, the defects imputed to the code may be fairly attributed to this fact. The radical design of the new system of civil procedure is to obliterate the distinction between the forms of action and between legal

and equitable suits, so that all the rights of the parties in relation to the subjects of litigation can be determined in one action, instead of dividing them as heretofore between different suits, often inconsistent and always perplexing. This system has been adopted not only in New York, but in Ohio, Kentucky, Missouri, Minnesota, California, Oregon, and in several other states, and has materially affected the legislation of Great Britain and her colonies. In 1857 Mr. Field was appointed by the legislature of New York as the head of a new commission to prepare a political code, a penal code, and a civil code, works designed to contain, with the codes of procedure, the whole body of the law. These several codes have been completed and reported, but have not as yet been adopted by that state. Other states have, however, drawn largely from them in their legislation, and in California they have been adopted entire, with only such changes and modifications as its constitution and conditions required. In 1866 he brought before the British association for the promotion of social science, at its meeting in Manchester, a proposal for a general revision and reform of the law of nations, similar to that which he had before undertaken in regard to the civil and criminal law. He procured the appointment of a committee consisting of eminent jurists of different countries, charged with preparing and reporting to the association the outlines of an international code, to be first submitted to their careful revision and amendment, and, when made as complete as possible, to be presented to the attention of the different governments, in the hope of receiving at some time their approval and adoption as the recognized law of nations. As the distinguished jurists composing this committee resided in different countries, it was difficult for them to act in concert, and each was left to act independently. Mr. Field, as the sole American representative, took the whole matter upon himself, and in 1873, after the lapse of seven years, presented to the social science congress his completed work, in a volume of nearly 700 pages, which he styles "Outlines of an International Code." This work has attracted no little attention from European jurists. In the same year he attended a meeting held at Brussels, composed of delegates from all parts of Europe to consult upon this subject. This resulted in the formation of an association for the reform and codification of the laws of nations. The association consists of jurists, economists, legislators, and politicians, with branches in different countries. Its object is to substitute arbitration for war in the settlement of disputes between nations. Of this association Mr. Field was elected president. In August, 1873, he left the United States, proposing to make a tour around the world. **III. Stephen Johnson**, an American jurist, brother of the preceding, born at Haddam, Conn., Nov. 4, 1816. At the age of 18 he went to the East, and passed nearly three

years at Smyrna and at Athens, engaged in the study of modern languages, particularly Greek. He returned in the winter of 1832-'3, and in the following autumn entered Williams college, from which he graduated in 1837. He studied law in New York with his brother, and on admission to the bar became his partner, and thus continued until the spring of 1848, when he went abroad, and passed a year in Europe. On his return in the autumn of 1849 he went to California, where he has ever since resided. He was among the first settlers of what is now the city of Marysville, was elected its first alcalde, and held that office until the organization of the judiciary under the constitution of the state. Although the jurisdiction of the alcalde courts under the Mexican law was limited and inferior, yet in the then existing state of things in California unlimited jurisdiction, civil and criminal, was asserted and exercised by them. In October, 1850, he was elected to the legislature, and during the session of 1851 was an active member of that body. He introduced and succeeded in getting passed the several laws concerning the judiciary, and regulating the procedure, civil and criminal, in all the courts of the state. He was also the author of that provision of law which gave controlling form to the regulations and customs of miners in the determination of their respective claims, and in the settlement of controversies among them; a provision which solved a very perplexing problem, and has ever since remained undisturbed. In 1857 he was elected a judge of the supreme court of California for six years, from Jan. 1, 1858. A vacancy occurring previous to the commencement of his term, he was appointed to fill it, and took his seat on the bench Oct. 13, 1857. In September, 1859, he became chief justice of the state. The law of real property in California was placed on a solid basis while he was on the bench, and principally by decisions in which he delivered the opinions of the court. In March, 1863, he was appointed by President Lincoln an associate justice of the supreme court of the United States. As such he delivered the opinion of the court in the well known test oath cases. His dissenting opinions in the legal-tender cases, in the confiscation cases, and in the New Orleans slaughter house case, have also attracted attention. In 1878 he was appointed by the governor of California one of a commission to examine the code of laws of that state, and to prepare amendments to the same for legislative action.

IV. **Cyrus West**, an American merchant, brother of the preceding, born at Stockbridge, Mass., Nov. 30, 1819. He was educated in his native town, at the age of 15 became a clerk in New York, and in a few years was at the head of a large and prosperous mercantile house. In 1853 he partially retired from business, and spent six months in travelling in South America. On his return he became deeply interested in the project of a telegraph across the ocean. He was first applied to for aid to com-

plete a land line, which had been begun in Newfoundland, to cross the island, 400 miles, from Cape Ray to St. John's, from which it was intended to run a line of fast steamers to the west coast of Ireland, and thus bring America within a week of Europe. While studying the subject, and turning over the globe in his library, the idea flashed upon his mind, "Why not carry the line across the ocean?" In this idea was the germ of one of the greatest enterprises of modern times, that of telegraphic communication between the old world and the new. His first step was to obtain legal authority. For this purpose he went in March, 1854, to St. John's, Newfoundland, and obtained from the legislature of that colony a charter, granting an exclusive right for 50 years to establish a telegraph from the continent of America to Newfoundland, and thence to Europe; and he thereupon associated with himself Peter Cooper, Moses Taylor, Marshall O. Roberts, Chandler White, and Wilson G. Hunt, of New York, under the title of the "New York, Newfoundland, and London Telegraph Company," for the purpose of carrying this design into effect. Mr. Field thenceforth devoted himself almost exclusively to the execution of this project. To build the land line of telegraph across Newfoundland and Cape Breton island took more than two years. While this was in progress he went to England, and ordered a submarine cable, to connect Cape Ray and Cape Breton. This was sent out in 1855, but was lost in a gale in the attempt to lay it across the gulf of St. Lawrence. The attempt was renewed the following year with success. In that year (1856) he went to London, and there organized the "Atlantic Telegraph Company," to carry the line across the ocean, and himself subscribed for one fourth of the whole capital of the company. By his personal application he procured from the British and American governments aid in ships, and accompanied the expeditions which sailed from England in 1857 and 1858 for the purpose of laying the cable across the Atlantic ocean. Twice the attempt failed—in 1857, and the first time in 1858. The third attempt proved successful, and in August, 1858, telegraphic communication was established across the ocean. The cable, however, worked only a few weeks, and then became silent. To resuscitate the project now became more difficult than ever, as the public had lost faith. From that time it was kept alive only by the ardent faith and indomitable will of its projector. He was continually passing to and fro between America and Europe, inspiring fresh courage and gathering new resources. But obstacles multiplied, civil war broke out in the United States, and the nation, absorbed in its own affairs, had no time for foreign enterprises. Thus seven years passed away before the attempt was renewed. But at last, in 1865, another expedition was prepared. Submarine telegraphy had been greatly improved; a better cable was construct-

ed; and the Great Eastern took it on board, and sailed to the west. Over 1,200 miles had been laid, when by a sudden lurch of the ship the cable snapped and was lost. The bottom of the sea was dragged for days in vain, and the expedition returned defeated to England. The year 1866 saw still another expedition, which this time proved successful. The cable, 2,000 miles long, was safely stretched across the ocean, and the communication proved perfect. After landing this the Great Eastern returned to the middle of the ocean in search of the cable lost the year before, and after a month's labor finally succeeded in grappling it at a depth of two miles and bringing it to the surface, and, joining it to the cable on board, carried it safely to the western shore. Thus, after 12 years of incessant labor, in which he had crossed the ocean some 50 times, Mr. Field saw the great object of his life accomplished. Congress voted unanimously to present him a gold medal, with the thanks of the nation; while the prime minister of England declared that it was only the fact that he was a citizen of another country that prevented his receiving high honors from the British government. John Bright pronounced him "the Columbus of modern times, who by his cable had moored the new world alongside the old." The great exposition in Paris in 1867 gave him the grand medal, the highest prize it had to bestow. Since that year two other cables have been successfully laid, and telegraphic communication across the Atlantic ocean has never been interrupted for a single hour. V. Henry Martyn, an American clergyman, brother of the preceding, born at Stockbridge, Mass., April 8, 1822. He graduated at Williams college at the age of 16, and after four years' study of theology became pastor of a church in St. Louis in 1842. After five years he resigned his charge to go abroad. In 1847-'8 he was in Europe, and after returning he published a historical sketch of the Italian revolutions, and a letter from Rome on "The Good and the Bad in the Roman Catholic Church." In January, 1851, he was settled at West Springfield, Mass., whence he removed in 1854 to New York, to become one of the editors of the "Evangelist," a religious journal, of which he subsequently became proprietor. In 1858 he again made a tour in Europe, which he described in a volume entitled "Summer Pictures from Copenhagen to Venice" (New York, 1859). In 1867 he went abroad again to the great exposition in Paris, and as a delegate to the Free church of Scotland and the Presbyterian church of Ireland. His last book is a "History of the Atlantic Telegraph." He has also published "The Irish Confederates, a History of the Rebellion of 1798" (1851).

FIELD, John, a British composer, born in Dublin, July 26, 1782, died in Moscow, Jan. 11, 1837. His father was a violin player in the orchestra of the Dublin theatre. He received his first instructions upon the piano-

forte from his grandfather, who was an organist. Subsequently he became a pupil of Muzio Clementi, whom he accompanied to Paris, Vienna, and finally to St. Petersburg, where Field took up his residence, remaining after Clementi's departure in 1804. In 1822 he removed to Moscow, where as at the former city his concerts were attended with success and pupils flocked to him in great numbers. He visited London and Paris in 1832, proceeded thence to the south of France, passed a portion of 1834 and 1835 at Naples, where he was for nine months in a hospital, and in the latter year returned to Russia, broken down by sickness and poverty, the result of his two besetting faults, idleness and intemperance. His laziness was so great that it is related of him that when he dropped his cane in the street he stood till some good-natured passer-by picked it up for him. As a pianist he was almost without a rival in respect to delicacy, poetic feeling, and grace of style. He especially excelled in the finish with which he rendered the works of Sebastian Bach, which he made popular even in Paris. Among his chief compositions, which are not numerous, are seven concertos for piano and orchestra, three sonatas dedicated to Clementi, and 18 nocturnes. Of the last named form of composition, afterward so extensively used by Chopin, Kalkbrenner, and other composers, Field was the inventor; and his nocturnes are the most popular as well as the most meritorious of his works.

FIELDFARE, a European bird of the thrush family, the *turdus pilaris* (Linn.), in form, size, proportions of parts, and characters of the plu-

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Fieldfare (*Turdus pilaris*).

image, resembling the migratory thrush or American robin (*T. migratorius*, Linn.). The length is between 10 and 11 in., the extent of wings $17\frac{1}{2}$, the tarsus $1\frac{1}{2}$, and the weight about 4 oz.; it is a stout bird, and from its long tail and wings rather elegant in form. The bill, which

is that of the thrushes, is orange at the base and brownish black at the end; the inside of the mouth is orange, the edges of the lids yellow, the iris brown, the feet and claws dusky; the head, hind neck, and rump are gray, most of the feathers on the first with a central dusky streak; a space before the eye brownish black, and a whitish line over the eye; the anterior half of the back and the wing coverts are chestnut, shading behind into ash-gray; fore neck and breast yellowish red, with elongated triangular brownish black spots, the sides paler with broadly rounded spots; the lower breast and abdomen grayish white tinged with red; the wings are grayish black, with the edges of the feathers paler; tail deeper black, the lateral feathers grayish toward the end; the lower wing coverts and axillary feathers are pure white, conspicuous during flight. The specific name is derived from a few hairy filaments on the occiput, which are also found in other species, and even in other genera. The female very closely resembles the male. The above is the plumage when it enters Great Britain from the continent; varieties in size and coloring are met with, and albinos are occasionally seen. They arrive in October and November, and some remain until the following spring if the season is mild; they roost in trees if they can, leaving for the fields at early dawn, in parties of from three or four to many hundreds; their flight is easy but not rapid, and their movements in the trees and on the ground are graceful; they frequent open fields, associating often with other species, and are generally very shy. The food consists of hawthorn and other berries, worms, larvæ, insects, seeds, and grains. They generally disappear in April or May, retiring probably in summer to the north to breed; the nests are built in society, usually in fir and spruce trees, and with the eggs, five or six in number, resemble those of the blackbird. The flesh is tender, fat, and of good flavor; this is supposed to be the species so highly esteemed by the Romans.

FIELDING, Copley Vandyke, an English painter in water colors, born about 1787, died in Worthing, Sussex, March 8, 1855. He belonged to a family of artists, and his first picture was exhibited in 1810. He early became a teacher, and acquired many pupils and friends. On the death of Joshua Cristall, he was elected president of the old society of painters in water colors, which office he held till his death. Fielding's favorite subjects were either rich wooded landscapes, or ships at sea off a stormy and rock-bound coast. From these two types he seldom varied. His manipulation was peculiar, but it represents atmospheric effects with great freshness. The demand for his works was so great that they were produced too rapidly, and fell into mannerism.

FIELDING, Henry, an English novelist and dramatist, born at Sharpham Park, near Glastonbury, Somersetshire, April 22, 1707, died in Lisbon, Oct. 8, 1754. His father was a grand-

son of the earl of Desmond, and great-grandson of the first earl of Denbigh, and served under Marlborough, attaining the rank of lieutenant general at the close of the reign of George I. The family of the Fieldings is stated in the English peerages (where the name is spelled Feilding) to be descended from the same ancestry as the imperial house of Hapsburg. The early education of Fielding was intrusted to the care of the Rev. Mr. Oliver, a private teacher in Gen. Fielding's family, and who, it is said, appears in "Joseph Andrews" as Parson Trulliber. He received but little benefit from his tutor, and was sent at an early age to Eton, where he distinguished himself by his brilliant parts, and before his 16th year had made great progress in classical learning. From Eton he was sent to the university of Leyden, where he applied with assiduity to his studies, but led so gay a life that his father, who had taken a second wife, and had a numerous family, found himself unable to defray the cost of his son's extravagance. In his 20th year Fielding was compelled to return to England, and was at once thrown upon his own resources, with a fondness for costly pleasures and but slender means of paying for them. His father had promised him an allowance of £200 per annum; but this, as Fielding said, "any one might pay who would." His vivacity, good humor, and talent gained him the companionship of the most eminent wits of his time; and after he arrived in London, while yet a minor, he commenced writing for the stage. His first comedy, "Love in Several Masques," was produced in 1727, when he was but 20 years of age. He wrote his dramatic pieces with great rapidity, and threw into them a marvellous amount of wit and satire. As the pay he received was small, the necessity for constant production left him little time to make elaborate plots, or to pay much attention to the characters of his plays. "The Wedding Day," one of his most successful comedies, gained him but £50, and his vocation of a dramatist brought him in contact with acquaintances who were not calculated to improve either his finances or his morals. In the midst of his gay career, while living from hand to mouth by his pen, and writing his plays on the backs of his tavern bills, he formed an acquaintance with Miss Craddock of Salisbury, whom he married in his 27th year. As his wife had a fortune of but £1,500, the financial condition of the dramatist was not much improved by his marriage. He retired to a small estate in the country which he had inherited from his mother, worth about £200 per annum. He was devotedly attached to his young bride, and made serious resolutions of reform. He gave up writing for the stage, having produced about 20 comedies, farces, and burlesques, only one of which, the burlesque of "Tom Thumb," has kept its place in the theatre. He applied himself with great vigor to literary studies in his country retreat;

but he also gave himself up to such pleasures as the country afforded, and was soon insolvent, and compelled to return to London to retrieve his fortunes. At the age of 80 he entered himself a student at the Inner Temple, studied diligently, and in due course was admitted to the bar. But repeated attacks of the gout compelling him to abandon legal practice, he again had recourse to his pen. He renewed his connection with the theatre, and wrote essays, poems, satires, and whatever else the taste of the day demanded, for literary periodicals. Though he could no longer travel his circuit, he turned his legal acquirements to account by preparing a work on crown law, which evinced his remarkable capacity for patient drudgery. Failing to obtain from these sources the income requisite for his daily wants, he wrote nearly the whole of the literary contents of the "Champion," a periodical which is now only known from his contributions. But now his genius was first attracted to that sphere for which it was best adapted, and in which he was destined to secure an enduring fame. His first novel, "Joseph Andrews" (1742), professedly in the manner of Cervantes, was begun as a burlesque on Richardson's "Pamela," which was then the most popular novel of the time. Fielding's work is infinitely better than the author intended to make it, and, if his fame rested upon that work alone, he would be remembered while the language in which it is written endures. In 1748 he published three volumes of "Miscellanies," including the "Journey from this World to the Next," a work which, though incomplete, and seemingly without any special plan, exhibits much imagination and satirical power. "The History of Jonathan Wild," which appeared about the same time, is a storehouse of wit, profound thought, serious satire, and benevolence so genuine, that even under the guise of the greatest villains we are made to love our brother man. The Newgate ordinary in this great prose satire is the representative of the whole class of worldly-minded ecclesiastics, as much so as Macbeth is the type of unscrupulous ambition, or Othello of noble jealousy. Shortly after the publication of "Joseph Andrews," amid an accumulation of illness, broken fortunes, and constant disappointments, he lost his wife, whom he tenderly loved and most sincerely mourned; though in a few months after her death he married her maid, an act curiously apologized for by his relative, Lady Mary Wortley Montagu. Though he had faithfully served the whig party with his pen, the only reward he received was his appointment, in his 42d year, when his constitution was completely broken, as an acting magistrate for Westminster. He was not content to confine himself to his official duties, but published several tracts on the causes of crime and pauperism in the metropolis, one of which may be regarded as the first temperance tract ever published; it was "An Inquiry into the

Increase of Thieves and Robbers." Robbery was then frightfully prevalent, and he attributed it to the great consumption of gin. Amid all these avocations he found time to write that greatest of all compositions of its class, "Tom Jones, or the History of a Foundling" (1749). His third novel, "The History of Amelia," wherein he portrays the virtues of his first wife and the reckless conduct of his own earlier years, and on which he probably bestowed more careful labor than on any of his other productions, was published in 1752. To eke out his inconsiderable income from his official position and from the sale of his writings, he started in this year another literary undertaking, "The Covent Garden Journal, by Sir Alexander Drawcansir, Knight, Censor General of Great Britain." He now undertook as magistrate, at the request of the duke of Newcastle, the prime minister, to extirpate several gangs of ruffians which infested London; and in this, amid great bodily suffering, and with very meagre pecuniary aid, he completely succeeded. But at length his bodily strength would no longer sustain the burden imposed upon it; the dropy with which he had long been troubled had alarmingly increased, and he was induced to try the influence of a change of climate, Lisbon being selected as the most desirable place for the purpose. He left England June 26, 1754. The journal which he kept of his voyage gives a most touching proof of his affectionate and noble nature in detailing the events of his parting with his family. Though suffering great pain, being hardly capable of moving himself, and forced to be continually tapped, his intellect retained all its activity; he made a record of all the incidents of his voyage, and he furnishes us in his journal the best account we have of the condition of shipping in the last century, and of the inconveniences, troubles, and delays to which those were subjected who made passages by sea. The climate of Lisbon did not agree with him, and he died two months after his arrival, leaving behind him his second wife and four children, all of whom were generously provided for by his brother Sir John Fielding, aided by his friend Allen, the original of Squire Allworthy, to whom he dedicated "Tom Jones," and in allusion to whom he had said, if a letter were inscribed simply *Detur Optimo*, there would be few persons who would think it needed any other direction. Great as were the literary labors of Fielding, they were hardly more important than those which he rendered as a police magistrate, in reforming the laws, and in introducing measures for the extirpation of thieves and desperadoes.—The works of Fielding have passed through very many editions, the principal of which are those of 1762 (4 vols. 4to and 8 vols. 8vo, London), with a life of the author; 1784 (10 vols. 8vo), with an essay on his life and genius by Arthur Murphy; 1821 (10 vols. 8vo), edited by Alexander Chalmers; 1840 (imp. 8vo), with a life and notice of his

works by Thomas Roscoe; "Select Works," with a memoir by Sir Walter Scott (royal 8vo, Edinburgh, 1821); and that edited by James P. Brown (10 vols. 8vo, London, 1871).—See Thackeray's "English Humorists of the Eighteenth Century" (London, 1853).

FIELDING, Sarah, an English authoress, sister of the preceding, born in 1714, died in Bath in 1768. Her principal works are "The Adventures of David Simple in search of a Faithful Friend" (2 vols. 12mo, London, 1744; a 3d vol. added in 1752); "History of the Countess of Delwyn;" "History of Ophelia" (2 vols. 12mo, 1785); and "Lives of Cleopatra and Octavia." In 1762 she published a translation of "Xenophon's Memorabilia of Socrates, with the Defence of Socrates before his Judges," in which she was assisted by Mr. Harris.

FIELD MARSHAL. See **MARSHAL.**

FIELD MOUSE. See **MOUSE.**

FIELDS, James Thomas, an American author and publisher, born at Portsmouth, N. H., Dec. 31, 1817. He was educated at the high school of his native city, and at the age of 14 went to Boston to become a clerk in a book store. At 18 he was invited to deliver the anniversary poem before the Boston mercantile library association, Edward Everett being the orator of the occasion. Twelve years later he read before the same society a poem entitled "The Post of Honor," the oration being by Daniel Webster. Soon after he reached the age of 21 Mr. Fields became a partner in the bookselling firm of Ticknor, Reed, and Fields, which about 1844 by the withdrawal of Mr. Reed became the house of Ticknor and Fields, and was soon honorably distinguished by the high character of its publications, especially of poetry. Among the American authors whose works it issued were Emerson, Hawthorne, Holmes, Longfellow, Lowell, Thoreau, and Whittier. Mr. Ticknor died in 1864, and the firm became Fields, Osgood, and co. In 1870 Mr. Fields withdrew from it to devote himself to authorship and to public lecturing. While a publisher he collected and edited in 22 vols. the writings of Thomas De Quincey. For several years he edited the "Atlantic Monthly." In 1849 he published a volume of his poems, in 1854 printed another for private distribution, and in 1858 a third entitled "A Few Verses for a Few Friends." His latest publication is a volume of prose sketches of his literary friends, entitled "Yesterdays with Authors" (1873). In November, 1873, he delivered six lectures on modern English literature before the Lowell institute at Boston. He visited Europe in 1848, 1851, and 1859.

FIERI FACIAS, the name of a writ at common law, so ancient that its origin is unknown. By it a sheriff, or other competent officer to whom it was directed, was ordered *quod fieri facias, de terris et catallis* (or *de bonis et catallis*), "that you cause to be made out of the lands and chattels," or "the goods and chattels of," &c., a certain sum of money, being that to

which the party for whom the writ was issued was entitled by the judgment of court; and it may be remarked that the only regular foundation for the writ of *feri facias* is a judgment of court. It is in fact the great writ of execution in general, though not exclusive, use throughout the United States, and is often spoken, or at least written of, by way of abbreviation, as a *fi. fa.* By virtue of it the officer to whom it is directed will obtain from the property of him against whom it is directed enough to satisfy the amount of debt or damages and costs, which are always specifically stated in the writ. The rights which this writ confers upon the officer, and the manner in which he is to exercise them, are to some extent matters of statutory regulation. In general it may be said that he must not obtain an entrance to a dwelling by breaking an outer door or window; and it was mainly from this rule that there grew up, with the aid of a little rhetoric, the famous apothegm that "every Englishman's house was his castle." But he may break the outer door of a building disconnected with a dwelling house, as a barn or store; and being peaceably, by voluntary admission or by entry without opposition, within a dwelling house, the sheriff may break open inner doors, or chests or boxes, in search of goods; and it is said that he may do this without the ceremony of asking that they be opened.

FIESCHI (singular **FIESCO**), one of the four principal families of Genoa and its territory, said to be of Bavarian origin. The Fieschi and Grimaldis adhered to the Guelphs, the Dorias and Spinolas to the Ghibellines. Their rivalries occasioned frequent wars in the republic of Genoa between the 11th and 16th centuries, when the failure of the conspiracy against the Dorias drove the elder branch of the Fieschi into France, and left the younger poor and powerless. They defied the authority of the city in an obstinate struggle in the early part of the 12th century, but finally their castles were captured and destroyed, and they submitted. In 1150 the republic granted them the privilege of erecting a palace in Genoa; and in 1191 they resigned to the republic their castle of Lavagna and their other fiefs, in return for which they received the right of citizenship and nobility. The Fieschi family has produced two popes, Innocent IV. and Adrian V., and a large number of cardinals, patriarchs, archbishops, and bishops, besides statesmen and warriors. (See **FIESCO**.)

FIESCHI, Joseph Marie, a French conspirator, born in Corsica in 1790, executed in Paris, Feb. 19, 1836. He served in the Russian campaign, and left the army in 1814 with the grade of sergeant. Subsequently joining Murat's fatal expedition to Calabria, he was spared by the Neapolitans as a Frenchman. From 1816 to 1826 he served a term in the penitentiary at Embrun for cattle stealing and forgery. He afterward went to Paris, obtained employment in a manufactory near the Gobelins, and also

served as a policeman and a spy. Convicted of having misappropriated funds intrusted to him as foreman, and of other misdemeanors, he led a miserable life till 1835, when he devised an infernal machine, with 25 gun barrels and many projectiles, for the assassination of Louis Philippe. His accomplices were Morey, a saddler, and Pepin, a grocer, the latter supplying him with money. They hired the third floor of a house in the boulevard du Temple, where Fieschi took up his quarters to await the passing of the king; a fourth accomplice, Boireau, a lamp maker, undertaking to act as watcher. The king, while holding a great military review on July 28, 1835, in celebration of the fifth anniversary of the revolution of 1830, passed the house, in the midst of an immense crowd, accompanied by three of his sons, when the explosion took place, which killed Marshal Mortier, duke of Treviso, chief of the royal staff, Gen. Lachasse de Vèrigny, and Lieut. Col. Rienssec. Altogether 11 persons were killed on the spot, 7 more died soon afterward, and 22 were wounded. The king and the princes escaped with some slight contusions caused by the rearing of the horses. Fieschi, wounded and covered with blood, escaped upon the roof of the house, and thence into a neighboring courtyard; but here he was arrested, and was long under medical treatment. On his recovery he attempted to make light of the affair and to deny his crime, but finally confessed and named as his accomplices Morey, Pepin, Boireau, and one Bescher. The last was acquitted. Boireau was condemned to 20 years' transportation; Fieschi, Morey, and Pepin were sentenced to death. During the trial Fieschi bore himself like a stage brigand, continually waving kisses to his mistress; and after the execution of Pepin and Morey, he continued to trifle and attitudinize at the foot of the scaffold.—See *Procès de Fieschi* (8 vols., Paris, 1836).

FIESCO, Giovanni Luigi, count of Lavagna, a conspirator of Genoa, born there about 1524, drowned Jan. 2, 1547. Wealthy, accomplished, and of high rank, he evinced from his earliest youth an insatiable lust of power, and succeeded in making himself popular with the common people. Andrea Doria was at that time the ruler of Genoa, and although Fiesco was not so much opposed to Andrea as personally exasperated against his nephew Giannettino (who was allowed a precedence of rank which was due to himself), he instigated, in concert with Calcagno, Verrina, Sacco, and other discontented politicians, a conspiracy with the view of overthrowing the existing government. The rebellion broke out in the night of Jan. 1-2, 1547. Giannettino Doria was killed, but his uncle the doge escaped. Fiesco himself fell into the water and was drowned while going on board a galley in the port of Genoa, and his death put an end to the outbreak. The life of his widow was spared, but two of his brothers, Geronimo

and Ottoboni, were put to death, and the other leaders of the revolt had their property confiscated and were banished by the doge, although an amnesty had been originally granted to them by the senate. An account of the conspiracy of Fiesco was written in 1629 by Augustino Mascardi, and after him by Cardinal de Retz. It also forms the subject of Schiller's tragedy, *Fiesco*.

FIESOLE (anc. *Fæsula*), a town of Italy, in the province and 3½ m. N. E. of the city of Florence, with which it is connected by an uninterrupted chain of villas; pop. about 2,500. It is the seat of a bishop, and has a cathedral and an episcopal seminary. In antiquity *Fæsulæ* was one of the chief towns of Etruria. Sulla established there a military colony, and the town was the headquarters of Catiline after his escape from Rome. In A. D. 405 the Roman general Stilicho gained near it a great victory over the barbarians under Radagaisus. In 1010 it was dismantled and destroyed by the Florentines.

FIESOLE, Giovanni Angelico da. See **ANGELICO**.

FIÉVÉE, Joseph, a French politician and author, born in Paris, April 8, 1767, died there, May 7, 1839. He lost his father at an early age, and was apprenticed in a printing office, devoting himself also to literature and politics. He embraced the principles of the revolution in 1789, and assisted Condorcet and Millin in editing the *Chronique de Paris*. Disgusted with the excesses of the terrorists, to whose downfall he contributed in 1794, he entered in 1795 upon a course of royalist partisanship, and was proscribed by the revolutionists, imprisoned in 1799, and restored to liberty on the 18th Brumaire. In 1802 he was sent by Napoleon upon a delicate mission to England, and on his return published a volume of letters concerning that country. In 1810 he was sent to Hamburg to examine the operations of certain agents, and under the first restoration was prefect of the department of Nièvre, from which post he was dismissed by Napoleon on his return from Elba. He afterward took part in editing several royalist journals, and especially contributed by his skill in polemics to the power of the *Journal des Débats*. He wrote several romances, remarkable for grace and simplicity, published a pamphlet in 1795, *Sur la nécessité d'une religion*, which first gave him a leading position in the religious and monarchical party, and left a great number of political treatises.

FIFESHIRE, a peninsular county of Scotland, bounded N., E., and S. by the frith of Tay, the North sea, and the frith of Forth, and W. by the counties of Clackmannan, Perth, and Kinross; area, 513 sq. m.; pop. in 1871, 160,310. The surface of the county is much diversified. The chief mountains are the Lomond hills, Largo Law, and Norman Law. The soil is of various quality, but so productive in general that fully two thirds of the whole is under cultivation. Agriculture is in a very advanced state.

The Fife breed of cattle have long been celebrated, and are in high repute both at home and in the English markets. Coal, iron, limestone, and freestone are abundant. Coal has been worked for several centuries, but ironstone, especially that called blackband, is of recent discovery. The principal manufacture is linen, which is carried on very extensively at Dunfermline and Kirkcaldy. There are salmon fisheries in several of the rivers, and herring, cod, turbot, and haddock fisheries on the coasts. The principal towns are Dunfermline, Kirkcaldy, Cupar, Dysart, and St. Andrews.

FIG, the fruit of the *Ficus carica* (Linn.), a tree which is indigenous to Asia and Barbary, and is much cultivated in the warmer portions of the globe. The leaves of the fig tree are rough, lobed, and deciduous. The flowers are so curiously concealed from observation, that many persons think it has none, though they are very numerous, being borne inside of a succulent, hollow receptacle,

Fig (*Ficus carica*).

which first appears on the sides of the young shoots like a small round bud. This receptacle is called a *syconus*, and on being cut open the minute, chaffy, apetalous florets, each furnished with three stamens and two styles, will be seen lining its walls. If these florets have become duly impregnated, the *syconus*, after having remained entirely at rest for some time at half its growth, begins to swell again, augments considerably in size, becomes very pulpy and sweet when it ripens, assumes some kind of color, and is the fig. The pulpy, sweet mass will be found to be penetrated with small round seeds, each of which is the result of a minute chaffy floret. The fig tree attains a height of 20 ft., with a branching, spreading head, like an apple tree, in those countries where it is indigenous; but in northern countries it is seldom seen except as a shrub, unless when trained under glass. In the middle states, where cultivated in the open air, it is purposely kept low and shrub-like, so that it may be bent to

the ground and covered with earth in the winter, to protect it from frosts. In England the tree is usually planted against a low wall, in order that it may receive some of the heat reflected from the surface of the soil. Such walls are sometimes furnished with flues to conduct artificial heat to the ripening crops of figs in autumn. In some parts of France it is grown as a dwarf standard tree, the chief end being to keep the branches short, low, and spreading, in order that they may benefit by the sun's rays reflecting heat from the earth. The soil is manured occasionally and stirred once a year, and some slight protection is given to the lower branches and base of the trunk in the winter. In the south of England it has been treated in the same way with success. Two or more crops of fruit are produced from the fig tree by judicious pruning and training, each crop being produced on distinct sets of shoots. The second crop, for instance, grows from the eyes or buds of the shoots made in early summer, and if the season be sufficiently long and warm, the fruit will ripen; but this seldom happens in the open air. In hot climates the second crop is the most prolific and valuable, being what are called summer figs, and used for exportation. By continued high temperature eight crops a year have been produced in England.—The fig tree is easily propagated from cuttings, or by ringing some branch and surrounding the cut place by a small pot of earth, into which the roots will penetrate and increase to such extent that the branch may be separated before the fruit upon it has ripened. Branches also girdled by removing a narrow ring of the bark below the fruit-bearing parts, will produce earlier ripening figs, the process being found as safe and efficacious as with the pear tree or the grape vine. It is cultivated to a considerable extent around Boston, Mass., in conservatories and forcing houses such as are used in the cultivation of foreign grapes. Trained upon the back wall of such structures, by using espaliers or by nailing in the branches, a single tree may be made to produce large crops. The branches are spread out horizontally, and so arranged that they can be loosened from the walls, pruned, washed, and cleaned when necessary. Judicious management is important to prevent too great growth of young or useless shoots. By this mode two crops are secured.—There are many choice varieties of the fig, each having some peculiar merit. The London horticultural society's catalogue for 1842 gives 42 varieties, and in this number are comprised fruits of white, green, yellow, and brown colors. As an abundant bearer, and hardier than any other, the brown Turkey fig seems to be preferred. Downing considers it the best for the open air, and says that it has a delicious flavor. The brown Ischia, white Marseilles, Brunswick, and white Ischia are highly commended. The fresh ripened fig is delicious and luscious. Few, however, fancy it on first acquaintance, but experience soon decides in its favor over the

dried and pressed fruit of commerce. Nearly all the figs consumed in the United States and Great Britain are produced in Turkey.—The genus *Ficus* includes also the banian and the East India rubber tree.

FIGEAC, a town of France, in the department of Lot, on the railway from Périgueux to Rodez, in a deep valley of the Célé or Selle, an affluent of the Lot, 80 m. N. E. of Cahors; pop. in 1866, 7,610. It has a communal college, a library, a chamber of agriculture, a magnificent bridge, a railway tunnel 4,100 ft. long, manufactures of linen and cotton fabrics, dyeing houses, tanneries, &c., and some trade in wine and cattle. It is supposed to owe its origin to a Benedictine abbey, founded in 755 by Pepin the Short. It is the birthplace of the Champollions, to the younger of whom a statue has been erected.

FIGUERAS, a town of Spain, in the province of Gerona, Catalonia, situated on the road from Perpignan to Barcelona, 21 m. N. N. E. of Gerona and 14 m. from the French frontier; pop. about 10,500. The citadel or castle of San Fernando is regarded as one of the strongest fortresses of Spain. It was built about the middle of the 18th century, and will serve as an intrenched camp for 16,000 men. It was, however, captured by the French in 1808, retaken by the Spaniards in 1811, again captured by the French in the same year, and also in 1823.

FIGUERAS, *Estanislao*, a Spanish statesman, born in Barcelona, Nov. 13, 1819. After completing his studies he espoused the ultra liberal cause, but subsequently separated himself from it and became one of the editors of a journal which supported Espartero. In 1851 he was elected to the cortes; in 1854 he was a member of the Tarragona revolutionary committee, and in 1862 was reelected to the cortes. He was connected with the revolutionary attempts in 1866, and was imprisoned by Narvaez in 1867. After the downfall of Isabella (1868) he became a member of the revolutionary committee and judge. Subsequently he was again sent to the cortes, where he became a prominent leader of the republican party, and after the abdication of King Amadeus (Feb. 11, 1873), and the formation of the republic, he was appointed president of the executive council. Subsequently he was minister of the interior until the end of April, when he retired on occasion of the death of his wife.

FIGUEROA. *I. Francisco de*, a Spanish poet, born at Alcalá de Henares about 1540, died about 1620. He received a university education, served in the army, and in 1579 accompanied Carlos of Aragon, duke of Terranova, to Flanders. He wrote in Italian and in Spanish, and was called "the divine poet." His eclogue of *Tirsi* (his *nom de plume*) contains the first good Spanish blank verse. His poems, first published in 1625-'6, were republished in Ramon Fernandez's collection (Madrid, 1785-1804). *II. Cristóbal Suarez de*, a Spanish author, born in Valladolid about 1580, died about 1650. He

was a jurist and a soldier, and resided for a long time in Italy. His principal works are: *La constante Amarilis*, a pastoral romance in prose and verse (Valencia, 1609; French translation, 1614; 8d and best Spanish edition, Madrid, 1781); *El pasajero* (Madrid, 1617), a half narrative, half didactic work, containing his autobiography and severe attacks on Cervantes, Lope de Vega, and other dramatists; and *Plaza universal de todas ciencias y artes* (Madrid, 1615; new and enlarged ed., 1787).

FIGUIER, *Guillaume Louis*, a French writer on scientific subjects, born in Montpellier, Feb. 15, 1819. He studied chemistry under his uncle Pierre Oscar Figuiet, became a physician in Paris in 1842, professor of pharmacy in Montpellier in 1846 and in Paris in 1853, and wrote numerous scientific articles for the press. Among his many works are: *Exposition et histoire des principales découvertes scientifiques modernes* (4 vols., 1851-'7; 6th ed., 1862); *Histoire du merveilleux dans les temps modernes* (4 vols., 1859-'62); and *Vie des savants illustres depuis l'antiquité jusqu'au XIX^e siècle* (1866). Among recent English translations of his writings are the following: "The World before the Deluge" (new ed., 1 vol., 1866); "The Vegetable World" (1867); "The Ocean World" (1868); "The Insect World" (1868); "Birds and Reptiles" (1870); "Mammalia" (1870); "Primitive Man" (1870); "To-morrow of Death" (1871); and "The Human Race" (1872). These works are copiously illustrated, and have been widely circulated in the United States. M. Figuiet edits *L'Année scientifique et industrielle*, which has led to the publication of many similar annuals.—His wife, *JULIETTE BOUSCARET*, has published novels, and a drama, *Gutenberg* (1869).

FILANGIERI. *I. Gaetano*, an Italian publicist, born in Naples, Aug. 18, 1752, died July 21, 1788. From 1777 he held various offices at court, and in 1787 he was called to the supreme council of finance. His principal work is the *Scienza della legislazione*, the first four books of which were published between 1780 and 1784, and the fifth was left unfinished at his death, caused prematurely by his excessive labors. The *Scienza* has been translated into German, French, English, and Spanish. *II. Carlo*, duke of Taormina, son of the preceding, born in Naples in 1788, died in 1867. He was indebted for his military education at Paris to the kindness of Napoleon I., fought in the ranks of the French at the battle of Austerlitz, served in the Neapolitan army under Murat, and bravely exposed himself to the fire of the Austrian riflemen in 1815 by making a reconnaissance at the bridge of the Tanaro with only 80 men, on which occasion he was severely wounded. King Ferdinand II. placed him at the head of the artillery and of the engineers, employed him in 1848 in bombarding Messina and in quelling the rebellion in other parts of Sicily, and invested him as governor general of that island with unlimited power. During the short

reign of Francis II. (1859-'60) he was premier and minister of foreign affairs.

FILBERT. See HAZEL.

FILIBUSTER. The river Vly in Holland is said to have furnished the name flyboat in English, in Spanish *fibote*, or by a softening of the first syllable *filibote*, to a sort of small fast-sailing vessel of about 100 tons burden, which in the 17th century held in point of sailing qualities the place since occupied by the Baltimore clippers. The buccaneers of the West Indies, who began their depredations against Spanish commerce in mere row boats, as they acquired the means for a more formidable outfit, selected these vessels as the sort of craft best suited to their purpose. (See BUCCANEER.) Hence they became known in French as *filibusters*, and in Spanish as *filibusteros*, an appellation gradually extended in those languages to any kind of pirates. The term filibuster has recently been introduced into the English language—its use commencing in New Orleans, but thence rapidly spreading wherever English is spoken—as a designation for certain adventurers who, after the termination of the war between Mexico and the United States, busied themselves with setting on foot within the United States military expeditions designed to operate in the Spanish American countries to the south of us. Of these the expeditions under William Walker to Nicaragua were the most noted.—Filibustering is a cant term much used of late years in the legislative assemblies of the United States to designate the employment of parliamentary tactics to defeat a measure by raising frivolous questions of order, calls of the house, motions to adjourn, &c., in order to weary out the opposite party, or to gain time.

FILICAJA, Vincenzo da, an Italian lyric poet, born in Florence in 1642, died there, Sept. 24, 1707. His grandfather and father were senators, and he was educated with a view to that position. He studied Greek and Roman antiquity, philosophy, theology, and jurisprudence, indulging in poetry only as a relaxation from severer pursuits. He began with amatory verses, but the object of his affections dying in her youth, he determined thenceforth to write only on sacred or heroic themes. After his marriage, having only a small fortune, he retired to the country and gave his attention to the education of his children and to study. At this time he wrote many Latin and Italian poems, but without any intention of publishing them. After the raising of the siege of Vienna by the Turks in 1683, he celebrated the triumph of the Christian arms by elegant odes addressed to John Sobieski, to the emperor Leopold, to the duke of Lorraine, to the God of armies, &c. The ex-queen Christina of Sweden, whom he also celebrated, undertook to defray the expenses of his sons' education. He was appointed by the grand duke of Tuscany senator, and governor of Volterra, and afterward of Pisa. He then began the task of

preparing his works for publication, but died before its completion. His son published them under the title of *Poesie toscane di Vincenzo da Filicaja* (4to, Florence, 1707; 2 vols. 8vo, Venice, 1762). His sonnet *L'Italia* is esteemed among the finest in the Italian language.

FILIGREE (It. *filigrana*, from Lat. *filum*, thread, and *granum*, a grain), ornamental work in fine gold or silver wire, often made with little metallic beads or grains interspersed among the wires. The work may be complete in itself, or it may be used, as is the common method, by applying the wire in flattened and twisted shapes upon the surfaces of the trinkets or whatever else it is designed to adorn, and soldering it there in the patterns of stems and leaves of plants. It is much practised by the Italians, who derived the art from the eastern nations. In the production of silver filigree, artistically wrought into bracelets, flowers, and other ornaments, the Genoese workmen stand unrivalled, and their productions are sent to all parts of the world. In Sumatra the manufacture of filigree has been carried to great perfection, although the tools employed are coarse and clumsy. The wire-drawing tool is made of a piece of wire hoop; an old hammer stuck in a block serves for an anvil. The gold is melted in a crucible over a fire, a joint of bamboo blown through by the workman being often the only bellows. When the filigree is finished they cleanse it by boiling in water with common salt, alum, and lime juice, and to give it the fine purple color they call *saps* they boil it in sulphur water. The Chinese also make filigree, principally of silver, but of inferior elegance to the Malay work.

FILLMORE. I. A S. E. county of Minnesota, bounded S. by Iowa; area about 900 sq. m.; pop. in 1870, 24,887. It is intersected by Root river and its branches, and has a rolling surface and an excellent soil. The Southern Minnesota railroad passes through it. The chief productions in 1870 were 1,688,094 bushels of wheat, 889,956 of Indian corn, 976,281 of oats, 108,335 of barley, 92,402 of potatoes, 28,908 tons of hay, 595,114 lbs. of butter, and 27,137 of wool. There were 6,558 horses, 8,092 milch cows, 10,781 other cattle, 10,342 sheep, and 10,809 swine; 2 manufactories of carriages and wagons, 5 of barrels and casks, 1 of machinery, 6 of saddlery and harness, 1 of sashes, doors, and blinds, 8 of woollen goods, 4 flour mills, and 6 saw mills. Capital, Preston. II. A S. E. county of Nebraska, drained by the N. fork of Turkey creek and the W. fork of Big Blue river; area, 576 sq. m.; pop. in 1870, 238. It is traversed by the Burlington and Missouri River railroad.

FILLMORE, Millard, thirteenth president of the United States, born in the township of Locke (now Summerhill), Cayuga co., N. Y., Jan. 7, 1800, died in Buffalo, March 8, 1874. Cayuga co. was then a wilderness, with few settlements. The nearest house to that of the Fillmores was 4 m. distant. Young Fillmore's

education was limited to instruction in reading, writing, spelling, and the simplest branches of arithmetic. At 14 he was apprenticed to learn the fuller's trade. In 1819 he conceived the design of studying law. He had yet two years of his apprenticeship to serve, and agreed with his employer to relinquish his wages for his last year's services, and promised to pay him \$30 for his time. He made an arrangement with a retired lawyer, by which he was to receive his board in payment for his services in the office. In 1821 he went on foot to Buffalo, where he arrived an entire stranger, with \$4 in his pocket. Here he obtained permission to study in a lawyer's office, and supported himself by severe drudgery in teaching school and assisting the postmaster. By the spring of 1823 he had so far gained the confidence of the bar, that by the intercession of several of its leading members he was admitted as an attorney by the court of common pleas of Erie county, although he had not completed the period of study usually required, and commenced practice at Aurora, where his father then resided. In the course of a few years he acquired not only a large practice, but a thorough knowledge of the principles of the common law, which placed him in the first rank among the lawyers of the state. In 1827 he was admitted as attorney and in 1829 as counsellor of the supreme court of the state. In 1830 he removed to Buffalo, where he continued in the practice of the law until the autumn of 1847, when he retired from it on being elected comptroller of the state.—Mr. Fillmore's political life commenced in 1828, when he was elected representative to the state legislature by the anti-masonic party. He served three successive terms, retiring in the spring of 1831. He particularly distinguished himself by his advocacy of the act to abolish imprisonment for debt, which was passed in 1831, and which was drafted by him, excepting the portions relative to proceedings in courts of record, which were drawn by John C. Spencer. In the autumn of 1832 he was elected on the anti-Jackson or anti-administration ticket to congress. After serving one term he retired till 1836, when he was reelected as a whig. He was chosen again in 1838, and again in 1840. In 1842 he declined a renomination. In congress he rose gradually to the first rank for integrity, industry, and practical ability. During the early part of his congressional career a national bank was the prominent subject of discussion. Mr. Fillmore was never a warm friend of the bank, and took no part in the debates upon it. He was, however, a decided whig, and labored earnestly in support of the internal improvement and protective tariff policy of that party. In the struggle which took place upon the question of the reception of petitions for the abolition of slavery in the 25th congress, he supported Mr. Adams, and voted for their reception. In a letter written Oct. 17, 1838, he avowed that he was opposed to

the annexation of Texas so long as slaves should be held therein; that he was in favor of congress exercising all its constitutional powers to abolish the slave trade between the states, and in favor of immediate legislation for the abolition of slavery in the District of Columbia. He expressly stated, however, that he would not pledge himself as to his future course upon any of these subjects; but reserved the right to modify or change his views, as upon further reflection or examination he might deem proper. He took a prominent part in the debates in congress upon the subject of the burning of the steamer *Caroline* by British troops at Schlosser, on the Niagara frontier, in December, 1837. At the opening of the 26th congress, Dec. 2, 1839, the seats of five out of the six members from New Jersey were contested. The claimants who held the certificate of the governor were whigs; and so evenly were the parties in congress balanced, that if these were admitted to their seats the whigs would have the control of the organization; if not, it would be in the hands of the democrats. The whigs contended that the certificate of the governor, authenticated by the seal of the state, should be received as presumptive evidence of the right of the five members to their seats; that they should be permitted to participate in the organization of the house, and that afterward the claims of contestants to their seats should be investigated in the ordinary course of business. The democrats insisted that the house should decide the question before electing a speaker. A violent debate arose. Two weeks were consumed in discussing whether the five New Jersey members should be permitted to participate in organizing the house. A resolution to admit them was lost by a tie vote. A speaker was chosen on Dec. 16, and the discussion was then resumed. Mr. Fillmore was assigned a place on the committee on elections. He canvassed the entire vote of the state of New Jersey, devoting three months to this drudgery. A majority of the committee, being democrats, reported that the democratic contestants were entitled to the seats. The minority of the committee were satisfied that three at least of the whig members were unjustly excluded by the majority report. On March 6, by a strict party vote, overruling the decision of the speaker, Mr. Fillmore was declared to be out of order while supporting his views on this question, and all further debate was substantially prohibited. On March 10 the democratic contestants were admitted to their seats, and their title to them was confirmed by a party vote on July 16. Mr. Fillmore was one of the most prominent actors in this controversy, and by his labor in the committee and zeal in debate upon the questions involved, added greatly to his reputation throughout the country. Hitherto he had always been in a minority in congress; but the whig party was largely in the majority in the 27th congress, which assembled in 1841. A

new financial system, and an entirely new tariff, were to be devised and put in operation. Under the circumstances the position of chairman of the committee of ways and means was the most prominent in the house. It was assigned to Mr. Fillmore. The session continued nine months, during which time he was not absent a single hour from the house, though he did his full share of the labors of the committee. The preparation of the new tariff bill involved a laborious examination, digestion, and arrangement of figures and statistics. Although Mr. Fillmore did not profess to be the discoverer of any original system of revenue, still the tariff of 1842 was a new creation, and he is justly entitled to the distinction of being its author. At the same time, with great labor, he prepared a digest of the laws authorizing all appropriations reported by him to the house as chairman of the committee of ways and means, so that on the instant he could produce the legal authority for every expenditure which he recommended. Sensible that this was a great safeguard against improper expenditures, he procured the passage of a resolution requiring the departments, when they submitted estimates of expenses, to accompany them with a reference to the laws authorizing them in each instance. This has ever since been the practice of the government.—Mr. Fillmore retired from congress in March, 1843. He was the candidate for vice president, supported by his own state and by some of the western states, in the whig national convention which met at Baltimore, May 1, 1844. In the convention of the whigs of the state of New York, which met Sept. 11, he was nominated for governor, but was defeated by Silas Wright, Mr. Clay being defeated at the same time in the presidential election by Mr. Polk. In 1847 Mr. Fillmore was elected comptroller of the state of New York, an office which at that time included in its sphere many duties now distributed among various departments. In his report of Jan. 1, 1849, he suggested that a national bank, with the stocks of the United States as the sole basis upon which to issue its currency, might be established and carried on so as to prove a great convenience to the government, with entire safety to the people. This idea involves the essential principle of our present system of national banks.—In June, 1848, he was nominated by the whig national convention for vice president, with Gen. Zachary Taylor for president, and was elected in the ensuing November. In February he resigned the office of comptroller, and on March 5, 1849, was inaugurated as vice president. In 1826 Mr. Calhoun, then vice president, had established the rule that that officer had no power to call senators to order. During the controversies in the session of 1849-'50 occasioned by the application of California for admission into the Union, the question of slavery in the new territories, and that of the rendition of fugitive slaves, in which the most acrimonious

language was used, Mr. Fillmore in a speech to the senate announced his determination to preserve order, and that, should occasion require, he should reverse the usage of his predecessors upon that subject. This announcement met with the unanimous approval of the senate, which ordered Mr. Fillmore's remarks to be entered at length on its journal. He presided during the controversy on Mr. Clay's "omnibus bill" with his usual impartiality. No one knew which policy he approved excepting the president, to whom he privately stated that should he be required to deposit his casting vote, it would be in favor of Mr. Clay's bill. More than seven months of the session had been exhausted in angry controversy, when, on July 9, 1850, President Taylor died. Mr. Fillmore took the oath of office as president on July 10; President Taylor's cabinet at once resigned, and a new cabinet was nominated on the 20th. Its members were: Daniel Webster of Massachusetts, secretary of state; Thomas Corwin of Ohio, secretary of the treasury; A. H. H. Stuart of Virginia, secretary of the interior; Charles M. Conrad of Louisiana, secretary of war; William A. Graham of North Carolina, secretary of the navy; Nathan K. Hall of New York, postmaster general; and John J. Crittenden of Kentucky, attorney general. Of these, Mr. Webster died and Messrs. Graham and Hall retired in 1852, and were respectively replaced by Edward Everett of Massachusetts, John P. Kennedy of Maryland, and Samuel D. Hubbard of Connecticut. Mr. Fillmore immediately ordered a military force to New Mexico, with instructions to protect that territory from invasion by Texas, on account of its disputed boundary. Mr. Clay's bill having been in the mean time defeated, Mr. Fillmore on Aug. 6 sent a message to congress advising that body of the danger of a collision with Texas, and urging a settlement of the controversy in respect to its boundary. Various acts known as the compromise measures, and embracing substantially the provisions of Mr. Clay's bill, were passed before the end of the month. The president referred to the attorney general the question whether the act respecting the rendition of fugitive slaves was in conflict with the provisions of the constitution relating to the writ of *habeas corpus*. That officer prepared a written opinion in favor of its constitutionality. The president concurred in this opinion and signed the act, together with the rest of the compromise measures. The fugitive slave law was exceedingly offensive to great numbers of the whig party of the north, as well as to those known strictly as anti-slavery men. Its execution was resisted, and slaves were rescued from the custody of the marshals by mobs at Boston, Syracuse, and Christiana in Pennsylvania, in the last of which places one or two persons were killed. The president announced his intention to enforce the law, and issued a proclamation calling upon all officers to per-

form their duty in its execution. Prosecutions were instituted in various instances against the rescuers, but without practical results, owing to the unpopularity of the law. Although Mr. Fillmore's administration, as a whole, was acknowledged to be patriotic, able, and useful; although his purity as a public man was unquestioned, and not a single other measure of his administration could be called unpopular, still, by signing the fugitive slave law, he lost the support of a very large proportion of his party in the northern states. In his message to congress in December, 1850, he recommended considerable reductions in postage; the establishment of an agricultural bureau; liberal appropriations for rivers and harbors; the establishment of an asylum for the relief of disabled and destitute seamen; a moderate but permanent tariff, with specific duties where practicable, and discriminating in favor of American industry; the opening of communication between the Mississippi and the Pacific; a provision for settling disputed land titles in California, and an extension of the system of land laws over the newly acquired territory; a law to provide for the retiring of superannuated officers from active service in the army and navy; a board of commissioners for the adjustment of private claims against the government; and, in conclusion, "an adherence to the adjustment established by the compromise measures, until time and experience should demonstrate the necessity for future legislation to guard against evasion and abuse." But his administration being in a political minority in both houses of congress, none of these recommendations were adopted, excepting those for the settlement of land claims in California and the survey of its public lands, and for an asylum for disabled and destitute seamen. During this session congress made an appropriation for the extension of the capitol according to such plan as might be approved by the president. Having adopted a plan, on July 4, 1851, he laid the corner stone of the extension, amid an immense concourse of people, who were addressed by Daniel Webster. Learning that an attempt was to be made to invade Cuba by lawless citizens of the United States, the president, on April 25, 1851, issued a proclamation warning them of the consequences. On Aug. 4, however, an expedition under Lopez, in the steamer Pampero, sailed from New Orleans by the connivance of the collector of that port and landed in Cuba. They were there captured; a number were executed, a few pardoned, and the remainder sent prisoners to Spain. Those sent to Spain were finally pardoned, and congress paid their expenses home. The collector of New Orleans was removed from office, and the steamer Pampero seized by the government, and condemned and sold for a violation of the neutrality laws. In his message of 1851, besides reiterating the views expressed in that of 1850, the president urged a revision of the

fee bill of the United States courts, a thorough revision and codification of the laws of congress then in force, and a law prescribing the relative rank of officers in the army and navy. Mr. Fillmore's administration is distinguished by the expedition of Commodore Perry to Japan, in a squadron which sailed in the autumn of 1852, and which resulted in a favorable treaty with that country. During the years 1851 and 1852 treaties were also formed with Peru, Costa Rica, Brazil, and other South American states. A steamer was sent to explore the Plata and its confluent. An expedition was also ordered by the president to explore the valley of the Amazon. This accomplished its object, and instructive reports were made by Lieuts. Herndon and Gibbon. Mr. Fillmore carried out strictly the doctrine of non-intervention in the affairs of foreign countries, and frankly stated his views upon this subject in an interview with Kosuth. At the same time, however, it appeared clearly enough by the celebrated letter of Mr. Webster, secretary of state, to M. Hülsemann, how little the administration sympathized with Austria in its struggle with Hungary. Daniel Webster died Oct. 24, 1852, and Edward Everett was appointed his successor as secretary of state. His brief term of office was distinguished by his letter declining the proposition for a tripartite treaty with England and France, by which each country was to disclaim then and for the future all intention to obtain possession of the island of Cuba. But in his message to congress in December, 1852, the president expressed his opinion that the incorporation of Cuba into the Union would be a hazardous and impolitic measure.—Mr. Fillmore retired from the presidency March 4, 1853. He left the country at peace within and without, and in the enjoyment of a high degree of prosperity in all departments of its industry. In his cabinet there had never been a dissenting voice as to any measure of his administration; and upon his retiring from office a letter was addressed to him by all its members, expressing their united appreciation of his abilities, his integrity, and his devotion to the public service. At the whig convention of 1852 he was a candidate for nomination as president; but though his policy, the fugitive slave law included, was approved by a vote of 227 against 60, he could not command 20 votes from the free states. During the spring and summer of 1854 he made an extensive tour through the southern and western states. In the spring of 1855, after an excursion through New England, he sailed for Europe, where he remained until June, 1856. While at Rome he received the news of his nomination as candidate for the presidency by the American party. He accepted the nomination, but before the close of the campaign it became evident that the real struggle was between the democrats and the republicans. Very many of those with whom he was the first choice for president cast their votes either for

Mr. Buchanan or Mr. Fremont, believing that there was no hope of Mr. Fillmore's election; and though he received the support of large numbers in all the states, Maryland alone gave him its electoral vote. Mr. Fillmore afterward resided in Buffalo, taking no prominent part in public affairs.

FILTER, an apparatus for separating from fluids the foreign substances mechanically intermixed with them. Beds of sand and gravel constitute natural filters, through which the surface water from rain percolates and may be collected in wells, or through which springs may pass upward from substrata. Artificial filters are constructed upon the same principle; a diaphragm of some substance is presented, through the pores of which the fluid can penetrate, but which are so fine that they arrest the particles held in suspension. They are variously constructed according to the nature of the fluid to be purified. The chemist takes a disk of thick unsized paper prepared for the purpose, doubles it twice, introduces it into a funnel of proper size, which, for facilitating the passage of the fluid, is commonly ribbed, opens one of the folds, and pours in the liquid. The fluid portion passes through the paper, leaving all the solid particles upon the filter. Filters used by chemists and apothecaries are usually made of paper, but felt, cloth, and cotton, woven and unwoven, are often used, as also layers of charcoal, sand, asbestos, and similar materials. The old pharmacutists used a cone-shaped bag of cotton or woollen called Hippocrates's sleeve, and the same contrivance is still considered one of the best for the clarification of sirups and other viscid liquids. The conical hat body made of felt is well adapted, before its shape is altered, to the filtration of fixed oils. Corrosive liquids, as strong acids, may be cleared by passing them through pure silicious sand supported upon coarse fragments of glass placed in the neck of a funnel and gradually diminishing in size upward. Charcoal is a favorite material, particularly for the purification of water used at sea; it has the property not only of separating the impurities passed through layers of it alternating with others of sand, but also of removing disagreeable odors. The Japanese use porous sandstone hollowed into the form of an egg, and set in a frame over a vessel, into which the water drops as it percolates through the stone. The Egyptians adopt the same method for clarifying the water of the Nile. A stone which answers this purpose well has long been known at Teneriffe, and was formerly largely imported into England. In Spain porous earthenware vessels are manufactured, called *alcarrasas*, which are used for this purpose, and also for wine-coolers. An ingenious filter was noticed at the London international exhibition of 1851, sent by the Wenham lake ice company of Massachusetts, the invention of Mr. Alfred Bird. It consists of a siphon, the short limb of which terminates in a cylindrical box, which

is placed in a cask of water under the surface. This box contains the filter, and on drawing the air out of the long arm, which projects from the cask, the water is forced up through the filter and passes through the siphon, its flow being regulated by a stopcock at the lower end of the long arm. It has the advantage, if the cask is kept properly supplied, of drawing the water neither from the top where the lighter sediment collects, nor from the bottom to which the heavier impurities sink. Filters upon a large scale are connected with the reservoirs from which cities receive supplies of water. These reservoirs are divided into several basins, the first of which are intended for receiving the sediment that will subside as the water is left standing; from these it passes through porous beds which separate them from an adjoining basin, and which collect the impurities still remaining suspended. By using several such basins the beds may be kept alternately in use, affording an opportunity for cleansing them whenever this is required. In many large reservoirs, as the Croton, no filtering apparatus is used, the water passing from the first to the second, and even to the third and fourth, and the separation of clear water and sediment being effected by precipitation. The water of such reservoirs is often filtered by attaching diaphragms to the delivering pipes in the houses.—In connection with the purification of water by filtration, ingenious methods have been devised of separating the soluble salts of lime, which give the property of hardness to water, and which being in the state of solution pass through the filter. Pure water can hold only about two grains to the gallon of carbonate of lime, or $\frac{1}{33.333}$; but as the water absorbs carbonic acid gas, its power of dissolving carbonate of lime increases till its capacity may be ten times that of pure water. Its hardness increases with the quantity of lime taken up. Thus the water of springs, especially in districts where calcareous rocks abound, differs in composition from the soft rain water which has not flowed through the ground. When such water is boiled, the excess of carbonic gas is expelled, and with it the capacity of holding a portion of the carbonate of lime. This falls as a precipitate, and forms the crust which collects on the inside of kettles in which such water is boiled. By continuing the boiling, all the lime may be thus separated, except about two grains to the gallon; and it is then in the best condition to be purified by filtering. Other salts, the solubility of which does not depend upon the carbonic acid gas present, can only be separated by distillation. Some substances often present in the state of suspension in water cannot be separated either by subsidence or filtration; such are some organic matters, and the fine clayey or aluminous particles. Waters which wash cliffs of clay become saturated with the impalpable material, which they almost wholly refuse to shed by any mechanical action. This

property may be witnessed upon a large scale in passing in a steamboat along the north shore of Lake Erie, where the water, particularly after a storm, carries the sediment from the clayey banks miles out into the lake, and receives from it a milky appearance.

FINBACK. See RORQUAL.

FINCH, a name given to many birds of the order *insectores*, suborder *oscines*, tribe *corvirostræ*, and family *fringillidæ*, including a numerous series of small and generally brilliant birds, with short, thick, more or less conical bill, without emargination at the tip. This family, according to Gray, comprises the subfamilies *ploceina*, or weavers, African for the most part, except the typical genus *ploceus* (Cuv.), which is Asiatic; *coccothraustina*, or hawfinches, well scattered over the globe, of which the rose-breasted grosbeak is a familiar representative in the United States; *tanagrina*, or tanagers, peculiar to this continent, especially to South America; *fringillina*, or finches, found all over the world; *emberizina*, or buntings, of which the common snow bunting is a good example; *alaudina*, or larks, of which the shore lark of the north and a second species on the Pacific coast are the only American specimens: this subfamily is by some, and with good reason, removed from the *fringillidæ*; *pyrrhulina*, or bullfinches; *loxina*, or crossbills; and *phytolomina*, or plant-cutters. The characters of the bullfinch, bunting, and crossbill have been given under those titles respectively; those of the grosbeaks, hawfinches, larks, plant-cutters, tanagers, and weavers, will be noticed in their alphabetical order; leaving nothing for this article but the proper finches.—The characters of the *fringillina* are, in addition to those already alluded to as belonging to the whole family, wings more or less lengthened and pointed; tail varying in length, sometimes with the feathers acuminate; tarsi rather shorter than the middle toe, in a few cases as long, slender and transversely scaled; toes long and slender, the hind toe moderate, with the claws curved and acute. The genus *estrellda* (Swains.) is found in Africa, Asia, and Australia, occurring in small flocks in meadows and bushy grounds, and occasionally visiting gardens. The wax-billed finch, or bengaly (*E. astrild*, Linn.), is of the size of a wren, about 4½ in. long; the bill is deep red, and a streak through the eye and the middle of the breast are of the same color; the general color above is brown, and below reddish gray, everywhere crossed with fine blackish undulations. This handsome bird inhabits Africa from Senegal to the Cape of Good Hope; it often commits considerable havoc in gardens, where it devours both buds and seeds; it is frequently kept in cages, more for its beauty than its song. The wings in this genus are short, and the flight is consequently for small distances at a time; the tail is lengthened. There are more than 40 other species. As a specimen of the genus *amadina* (Swains.), dif-

fering from the last chiefly in a more uniformly conical bill and in a short and rounded tail, may be mentioned the Java finch, commonly called here Java sparrow (*A. oryzirostra*, Linn.); other names are the paddy and rice bird. This is of the size of a sparrow, in length about 5 in.; the bill is stout and red; the eyelids are of the same color; the head and throat black; the sides of the head, under the eyes, white; the upper parts pale ash; belly and thighs pale rose, white toward the vent; the tail black. It inhabits Java, China, and India, where it occasionally does much mischief in the rice grounds; it eats seeds and insects; it is often seen here as a cage bird, and is a favorite for its beauty. There are more than 50 other species of the genus.—The typical finches are found in the genus *fringilla* (Linn.), which is distributed over all the world, living in flocks in which are often associated several species; their food consists of seeds of various kinds of plants and trees in winter, and of larvae, grubs, and grain in summer; some, like the red poll and the snow bird, are found in very cold regions. There are more than 80 species, which by Gray were brought under the Linnæan genus *fringilla*; some of the old subdivisions have been readopted in Prince Bonaparte's *Conspectus Avium*, and in Baird's catalogue of North American birds, but the simpler method of Gray will be adhered to in this article. In the genus *fringilla* the wings are long and pointed, and the tail is generally slightly forked. The chaffinch (*F. caelebs*, Linn.) has been described under that title, and the siskin (*F. spinus*, Linn.) under **ABERDEVINE**; the goldfinch (*F. carduelis*, Linn.), the redpoll linnet (*F. linaria*, Linn.), the snow bird (*F. [junco] hyemalis*, Linn.), and the yellow bird or American goldfinch (*F. [chrysomitris] tristis*, Linn.), will be noticed under their respective names.—The brambling or mountain finch (*F. montifringilla*, Linn.) is a little smaller than the chaffinch, being about 6½ in. long, with an extent of wings of 10½ in.; it resembles this bird in its form, mode of flight, gait, and manners; the bill is larger in proportion. The greater part of the upper mandible and the end of the lower are dusky, the base of the former pale gray, and the rest of the latter yellow; the head and back in the male are deep black, the feathers with a tinge of rusty gray; the throat, breast, and upper wing coverts are light reddish brown; the rump white tinged with yellow; the quills and larger coverts black, the former margined with yellow externally, the inner with a reddish margin and a white spot at the base; the sides spotted with black; the tail black; the exterior feather white on the outer web, and the middle ones edged and tipped with ash color; abdomen and lower tail coverts yellowish white. The female is much less bright; the sides of the head and the back of the neck are gray, the top of the head and back being dusky margined with gray; the rufous mark-

ings of the breast and wings are very faint; the size is smaller. It is seen in Great Britain in large flocks in winter, with the chaffinch and allied species, disappearing toward the end of spring, going north to breed; it is hardy and bold, feeding on seeds and what it can

pinus, Willd.; *chrysomitris*, Boie), distributed over North America from the Atlantic to the Pacific, is 4³/₄ in. long, with an extent of wings of 8¹/₂ in. The plumage is soft, but with little gloss; the short, conical, acute bill is light yellowish brown, with a dusky tip; the iris brown; general color above yellowish gray, with dark brown streaks; the wings and tail dusky, with grayish white edges; the base of the secondaries, the tips of their coverts, and the margins of the rump feathers are cream-colored; grayish white below, with streaks of dull brown, and a brown tinge on the fore neck; the female very closely resembles the male. This species, though seen in the southern states, prefers the northern regions of the country and the Canadas, wherever pine trees abound; it is most common in the north during winter, where it is seen in small flocks with the redpoll and the crossbill; the favorite food is found amid the branches of the highest fir trees, where they hang head downward like the titmouse; the seeds of the thistle and of the sweetgum are also much eaten by them. Though he could find no nests, Audubon met with great numbers of these birds accompanied by their young on the coast of Labrador toward the end of July; and they doubtless breed there. The mode of flight and notes resemble those of the goldfinch; like the latter, it sweeps through the air in long graceful curves, uttering its sweet and clear song as it takes a fresh start.—The genus *passer* (Briss.) includes the sparrows of the old world, which are rarely called finches. The American sparrows are contained in the genus *zonotrichia* (Swains.); many of these are popularly called finches; the bill is perfectly conical, the wings moderate, the tail long, broad, and nearly even at the end. The grass finch (*Z. graminea*, Gmel.; genus *podiceps*, Baird) is 5¹/₂ in. long, with an extent of wing of 10 in.; the general color above is a light brown, streaked and mottled with darker; a narrow circle of white around the eye; throat and breast yellowish white, the latter streaked with dark brown; the larger coverts and the quills deep brown, the former edged with paler, and the first of the latter with white external margin; lesser coverts bay; tail deep brown, marked and margined with white; sides and abdomen pale yellowish brown, the former streaked with darker; under tail coverts white. It is distributed far to the north and over the United States from the Atlantic to the Pacific, and there is a variety, or perhaps a species, to the west of the Alleghanies; it seems to prefer sandy and barren soils in cultivated districts; its song is sweet and protracted; it is shy and solitary, and runs nimbly through the grass, in which the nest is built; the eggs, four to six in number, are laid about the middle of April at the south, where two broods are generally raised each year; they are seven eighths of an inch long, bluish white, with reddish brown blotches; the food consists of various kinds of seeds and insects, and

1 Mountain Finch (*Fringilla montifringilla*). 2. Green Finch (*F. chloris*).

pick up in the open fields; its flight is rapid and undulating; the note is like the "tweet" of the chaffinch repeated several times; according to Montague, it builds a nest in fir trees, and lays four or five yellowish spotted eggs. Albinos of this species are occasionally seen. It is said to be very fond of beech mast.—The green finch (*F. chloris*, Linn.), also a European species, is about 6 in. long and 9 in extent of wings; the bill is very stout, the tail short, and the body bulky, which characters have led Mr. Gould to consider it rather a grosbeak (*coccothraustes*) than a finch, and it no doubt is one of the intermediate forms between this and *fringilla*. The male is bright olive green above, passing into yellow; the quills blackish gray, with outer webs bright gamboge yellow; the tail, except the two middle feathers, which are gray with light yellow margins, are yellow like the wings, with the external edges grayish brown; below greenish, passing into sulphur yellow; the bill is white, with a pink tinge; the legs brown; the young are marked with oblong dashes of brown on the lower surface and the upper part of the back. This is an indigenous, non-migratory, hardy bird, living in flocks, familiar and docile; it is often kept in confinement for its facility in imitating the notes of other birds; its own song consists of three or four short mellow notes, which are very pleasing during the breeding season; it is not particular in its choice of food, eating the usual grains and seeds given to caged birds. The eggs are four or five in number, pale bluish white, speckled at the larger end with reddish brown.—The pine finch (*F.*

the flesh is tender and of good flavor. This bird employs a great variety of artifices to deceive any one who approaches her nest, imitating lameness, and attempting to draw attention to another locality. Lincoln's finch (*Z. Lincolnii*,

1. Lincoln's Finch (*Zonotrichia Lincolnii*). 2. Seaside Finch (*Ammodromus maritimus*).

And.; *melospiza*, Baird) is yellowish brown above, with streaks of brownish black; head chestnut, streaked with brownish black, with a grayish blue band in the centre and two at the sides; quills and larger coverts deep brown with lighter margins, and the latter tipped with whitish; tail yellowish brown; throat white, with dusky streaks and spots; below grayish white. It is found as far north as Labrador, from the Atlantic to the Pacific, and south through Mexico to Guatemala. The song is very sweet and loud; the flight is rapid and low; the food is insects and berries; the males, as in most finches, are pugnacious.—The genus

Sharp-tailed Finch (*Ammodromus caudacutus*).

ammodromus (Swains.) has the wings short, the tail lengthened, the lateral feathers graduated, with the end of each acuminate; the species generally remain within the limits of tide water, and run along the shores among the weeds, like sandpipers, climb along the rushes, or swiftly

dart among the tufts of grass; they eat shrimp, small mollusks and crustaceans, and other minute marine animals. The sharp-tailed finch (*A. caudacutus*, Gmel.) is found along the whole Atlantic coast of the United States, being most abundant among the salt marshes of South Carolina. The crown of the head is bluish gray in the middle, and deep brown at the sides, with a band of yellowish red from the bill over the eye; hind neck dull gray, tinged with brown; fore neck pale yellowish red with dusky streaks, the throat paler and unspotted; back brown, tinged with gray; primaries and tail wood brown; secondaries and smaller coverts reddish brown; sides yellowish red, with dusky streaks; breast and abdomen grayish white. They come down to the marshes when the tide is out, returning to the shores and rice fields at high tide; the note is a single "tweet;" the nest is placed on the ground, near the water, in a slight hollow; the eggs, four to six, are laid sometimes twice in a season; the color is dull white, with light brown dots, most numerous at the larger end; from the quickness with which they move on the ground, they are most easily shot on the wing. The seaside finch (*A. maritimus*, Wils.), with similar habits to the preceding, and found in the same localities as far north as Long Island, has the crown of the head deep brown, surrounded by a line of grayish blue; upper part of the back, wings, and tail, olive brown mixed with pale blue; lesser wing coverts reddish brown; a yellow streak from the bill over the eye; throat and fore neck grayish white; breast and sides grayish blue, the abdomen paler. The eggs are grayish white, with brown freckles all over; many nests are found in company. The food consists of marine insects, snails, crabs, and beetles, and seeds.—Bachman's finch, placed in the genus *ammodromus* by Gray, belongs to the genus *peucaea* (Aud.); this (*P. æstivalis*, Licht.) is reddish brown above, with the centre of the feathers black and their margins bluish gray; the quills dark brown with lighter edges; tail feathers brown, lighter on the outer edges; ochre-yellow streak over the eye; throat pale yellowish gray; fore part of the breast and sides tinged with brown, lower parts yellowish gray. The length of the bird is 6 in., and the extent of the short wings only 8. The habits of this species render it difficult to observe; it runs in the grass more like a mouse than a bird, and is much oftener heard than seen; the notes are soft and sweet, justifying the remark that it is perhaps the finest songster of the sparrow family. The food consists of grass seeds, beetles, and berries. It is confined to the southern states.—In the genus *spiza* (Bonap.), or *cyanocephala* (Baird), the wings and tail are moderate, and the latter even. The nonpareil or painted finch (*S. ciria*, Bonap.) is 5½ in. long and 7¼ in extent of wings; in the adult male, the head and neck are azure blue; the back and lesser wing coverts yellowish green; circle round the eye, lower back, and under

parts carmine; quills and tail purplish brown; secondary coverts green. The female has a brown bill, the upper parts light olive green, and the under parts dull orange, paler behind; the male of the first year resembles the female, except in having the blue lower mandible of his sex; the adult male plumage is not obtained until the fourth year. It is an inhabitant of the south Atlantic and gulf states, extending into Texas and Mexico; its flight is short and quick, and its movements on the ground like those of the sparrows; its song is very sonorous and pleasing, and is continued through the hottest part of the day; the nest is usually built in an orange tree, and the eggs, four or five, are of a fine bluish pearl color, speckled with blackish. It appears in the vicinity of New Orleans about the middle of April, when great numbers are taken in traps, set with a stuffed specimen of a male bird; all males which perceive this are led by their pugnacious disposition to attack it, and the trap springs upon them during the operation; they are easily kept in confinement, and will sing and breed in captivity if properly cared for. Great numbers of this beautiful finch were formerly carried to Europe, where they brought almost fabulous prices, a bird which cost eight cents in New Orleans selling in London or Paris for more than twice as many dollars. Their flocks sometimes occasion considerable damage to ripe figs and grapes, of which they are exceedingly fond. The lazuli finch (*S. amana*, Bonap.) is another handsome and allied species, belonging rather to the Pacific fauna. The bill is brownish black; the head and neck, hind part of back and rump, are beautiful greenish blue; fore part of the back, scapulars, wings, and tail, brownish black, the feathers with blue margins; a conspicuous white band on the wings; on the fore part of the breast a broad band of brownish red; the sides, lower wing coverts, and tibial feathers, bluish gray; lower parts white. The female is far less brilliant, a grayish tint prevailing in most parts of the plumage. It is rather a shy bird, with a lively and pleasing song. Another beautiful species is the *S. cyanea* (Bonap.), which will be noticed under INDIGO BIRD.—The last finch which will be mentioned belongs to the subfamily of *pyrrhulina*, and to the genus *carpadacus* (Kaup). The purple finch (*C. purpureus*, Gmel.) is 6 in. long, with an extent of wings of 9 in.; the bill is very robust, conical, bulging, and acute, deep brown above, bluish below; the head, neck, breast, back, and upper tail coverts are of a rich lake color, nearly crimson on the head and neck, and fading into rose color on the abdomen; the fore part of the back is streaked with brown; the quills, larger coverts, and tail are deep brown margined with red; a narrow cream-colored band across the forehead close to the bill. The female and young are brownish olive above, with dark brown streaks; the under parts grayish white, the sides streaked

with brown; quills and tail feathers dark brown with olive margins; a broad white line over the eye, and another from the gape backward. In the southern states their flocks are seen from November to April, feeding on the interior of buds, which they husk with great

Purple Finch (*Carpodacus purpureus*). 1. Female. 2. Male.

skill; they are usually seen in the morning and at night, darting after insects. Their song is sweet and continued. They are found from Labrador to Louisiana, being replaced on the Pacific coast by the *C. Californicus* (Baird) and the *C. Cassinii* (Baird); they breed in the north, where they are seen in midwinter in company with crossbills and other hardy birds, feeding on the berries of the evergreens. Their nests have been found in Massachusetts; the eggs are of an emerald-green color, with a few black dots and streaks near the point, and some purplish blotches. The farmers believe them to be injurious to fruit trees by destroying the blossoms, great numbers of which they pull off. Audubon considers their flesh equal to that of any small bird except the rice bunting. They are sometimes kept in cages and in aviaries, but they do not sing in confinement.—Other sparrows and buntings are called finches in different parts of the country, though not belonging to the subfamily of *fringillina*, and may be found described among the *fringillidae* in works on ornithology.

FINCH, Henrice, earl of Nottingham, a British statesman and jurist, born in Kent, Dec. 28, 1621, died in London, Dec. 18, 1682. He was educated at Westminster school and at Christchurch college, Oxford, subsequently studied law in the Inner Temple, and rose to great eminence as a lawyer. During the revolution he enjoyed general respect and confidence. At the restoration he was made solicitor general, took part in the prosecution of the regicides, of which he wrote a full account, and in 1661 entered parliament as member for the university of Oxford. In 1667 he defended

Lord Clarendon, when impeached for high crimes and misdemeanors. After being successively attorney general and lord keeper, he was appointed in 1675 lord high chancellor of England. In 1681 he was created earl of Nottingham, having for some years previous borne the title of Baron Finch of Daventry. He pursued a steady and consistent course in difficult times, and was distinguished not only for his legal erudition and soundness of judgment, but also for his eloquence and great powers of reasoning. He published various parliamentary speeches and legal arguments, and left in manuscript some volumes of chancery reports, and notes on Coke's Institutes.

FINDEN, William, an English engraver, born in London in 1787, died there, Sept. 20, 1852. He became noted at an early age as an engraver of book plates. Being remarkable for a certain neatness of line and smoothness of finish, his works were very popular, and he was selected to engrave Lawrence's celebrated portrait of George IV., for which he received 2,000 guineas. He also engraved the "Village Festival" and the "Highlander's Return," both from well known pictures by Wilkie. He published some very extensive series of engravings, the best of them the "Gallery of British Art" by which he lost heavily.

FINDING. The law of finding is, in some particulars, not quite settled. It is certain that nothing can be found that was not lost; hence, unless the owner of property has it no longer in his possession or within his reach, and is deprived of all power over it, either by accident or voluntarily, as when he casts it away, another man who happens upon it acquires none of the rights of a finder. Lost goods were defined by the old law as *bona vacantia*; and Savigny, in his "Treatise of Possession," says, § 18: *Vacua est, quam nemo delinet*. The ancient law of treasure trove was said to apply to gold and silver only; and indeed only to that which had been purposely hidden in the earth, and of which the owner was unknown. Originally it belonged to the finder; but many centuries ago it was adjudged to belong, to a greater or less extent, to the sovereign, and Grotius says this rule had become in his time *jus commune, quasi gentium*. Blackstone ("Commentaries," vol. i., p. 296) makes a distinction between goods hidden by the owner, which the owner never reclaimed, being prevented by death, forgetting, or neglect, and goods voluntarily or accidentally cast abroad. In the first case there was no intention to abandon them, and when they were not the owner's they became the king's, to whom the finder must give them. In the latter case they became the property of the finder. The law of treasure trove never had much force in this country; and although there were formerly some colonial regulations and there are now some statutory provisions in respect to finding, they do not appear to have much force, unless it be in relation to what may be

termed wrecks. The law on this subject, so far as it can be gathered from the authorities, seems to be this: 1. The finder of lost property is owner of it against all the world excepting the original owner; but the owner may reclaim it from the finder at any time, although leaving it unclaimed in the finder's hands for a sufficient length of time after the owner knew where it was and could claim it (perhaps 20 years, the ordinary period of prescription, might be necessary), would be equivalent to a waiver or abandonment of his ownership. The finder has therefore all the rights of action of an owner, either to recover possession of it, or damages for loss of it or injury to it. 2. The finder is always at liberty to leave what he finds untouched, and cannot be made accountable for any injury thereafter happening to it. But if he takes it into his possession, he acquires some rights and comes under some obligations which do not seem to be perfectly well defined. On the one hand, it is said by the old authorities, that if the thing found perish by his mere neglect, or without his active aid, he is not responsible. But the tendency of modern law is, that while he may abstain if he pleases from any interference whatever, if he chooses to take what he finds into his custody, he makes himself responsible not only for any wilful injury to it (which is quite certain), but for the consequences of his gross negligence. 3. As the correlative rule, or as the right which corresponds to this obligation, he may demand from the owner all his expenses necessarily incurred in keeping and preserving the property, and probably his reasonable expense in the way of advertising, or for similar charges for the benefit of the owner. We should say that where a finder takes into his possession the thing found, it becomes a kind of bailment; and the owner, by reclaiming and receiving it from the finder, assents as it were to this bailment; and out of this constructive bailment grow the obligation and responsibility of the finder on the one hand, and his rights on the other. 4. It has been intimated by one high authority, at least, Judge Story ("Bailment," sections 35 *et seq.*), that the finder may also make a further charge against the owner for compensation for care and labor, and perhaps for reward. There are moral reasons for this, but no legal authority; and except when property is found at sea, and comes under the admiralty law of salvage, we know no law which authorizes the finder to claim more than his expenses. 5. For whatever the finder may lawfully demand of the owner in respect to the property found, he has, we think, as one of the consequences of the constructive bailment above spoken of, a lien on the property itself; that is, a right to hold it even against the owner until his demand is satisfied. 6. It seems now to be settled that the place where property is found has no effect upon the rights of the finder. Thus if A finds money on the floor of B's

store, and hands it to B for the owner, and B advertises, and does what else he should to discover the owner, and fails in this, the finder may demand it of B, tendering B's expenses in discharge of his lien. There was at one time some disposition to say that if A found goods buried in B's lands, they were the property of B; but this seems to have passed away, or rather never to have been settled law, and the rule above stated, that the place where found has no effect whatever on the right of the finder, is without qualification. 7. If a reward be offered, which is specific and certain, or can be made so by reference to a certain standard, the finder by bringing the thing found to the owner, or otherwise complying with the terms of the advertisement, becomes a party to a contract offered to all by the advertiser, and may sue for the compensation or reward promised. But if the advertisement is general only, as that the finder shall be liberally rewarded, the finder has no specific claim, and can have no action. 8. The rule that the finder is owner against all the world except the original owner has one important exception. A finder of what the law calls a *chose in action*, or mere evidence of debt or claim, cannot demand payment of it; and if one should pay a note, a check, or a lottery ticket, to a holder known by the payer to have come into possession of it by finding, the payer would be bound to pay the amount to the owner who could prove his property. 9. A finder may incur punishment as for crime, by misconduct about the property he finds. Thus, if he knows the owner, or there are circumstances which, if he chose to profit by them, would lead him to the owner, a conversion of the property to his own use is larceny or theft. But it is not larceny unless the *animus furandi* existed at the time of the appropriation; for if the finder only discovered the owner after he had made the appropriation, and then concealed his finding, it would seem to be the law that he is answerable only in damages.

FINDS, a term recently applied by English archaeologists to deposits of objects connected with human life, and sometimes associated with human remains, but of prehistoric or unknown origin. The chief aim of scientific research in regard to them is to ascertain the historical relation and condition of the human beings which they represent. As the development of civilization is not a uniform process, the discovery of a few objects made and used by a prehistoric tribe is not a sufficient index to the exact place of that tribe in history. Within certain limits there is a real consistency in stages of civilization; but in the present state of prehistoric archaeology it is hardly possible to make a classification which would correctly represent the sequence of forms and materials. The antiquaries of Denmark, a country especially rich in relics, classified their finds according to some leading features that seemed to indicate a regular sequence. They conclu-

ded that there had been an age when men used only implements of stone and bone, and were ignorant of the use of metals; that an age had succeeded when the use of bronze was known, and probably that of gold; and that there was a third age, when iron had superseded other metals for weapons and utensils. All the finds were consequently classified according to these three ages. It proved, however, that such exact lines could not be maintained. Men did not immediately cease to use stone implements when bronze was introduced; and bronze continued to be employed after the use of iron was well known. Another mode of classification is followed in France, where the finds are generally arranged in the museums after the following order:

Stone Age. { 1. Epoch of extinct animals.
2. Epoch of migrated existing animals.
3. Epoch of domesticated existing animals.

Metal Age. { 1. The bronze epoch.
2. The iron epoch.

This classification, suggested by the archaeologist Lartet, best serves our purpose of making a rapid survey and furnishing a short description of the objects found in ancient habitations of both hemispheres. For the various theories in relation to these finds, as well as for the nature of the places where they have been discovered, see **AMERICAN ANTIQUITIES**, **ARCHÆOLOGY**, **BONE CAVES**, and **LAKE DWELLINGS**. — *Stone Age*. Finds of objects classified as belonging to the first epoch of the stone age have been made principally in the caverns of Aurignac, in the hills of Fajoles, the Trou de la Fontaine, the cave of Sainte-Reine, the grotte des Fées at Arcy, the caves of Vergisson, Vallières, La Chaise, Gorge d'Enfer, Moustier, Pey de l'Azé, of Périgord, and of the department of Ariège, in France; in Kent's cave, Brixham, Gower, Kirkdale, and Wells, in England; in the caves of Chiampo and Laglio near Lake Como, of Palermo, San Ciro, and Macagnone, in Italy and Sicily; in a few caves in Spain, Algeria, Egypt, and Syria; in caves near the lake of Sumidouro in Brazil; and especially in Belgium, as near Liège, at Engis, Engihoul, and Naulette. In these caverns, and sometimes also on the surface of the ground or buried in it, have been found large quantities of chipped flints, arrowheads, and various stone implements, to all of which archaeologists usually give the common name of hatchets. The commonest of the worked flints is the almond-shaped type. These instruments are oval hatchets carefully chipped all over the surface so as to form a cutting edge. The Moustier type is a pointed flint wrought on one side, the other being entirely plain. The third type is that of knives; they are thin and narrow tongue-shaped flakes, with one of the ends chipped to a point, and were used as scrapers. Others were wrought so as to do service as augers. Near Amiens were discovered small globular bodies with a hole through the middle, which are believed to be

fossil shells used for adornment. There are many articles in the deposits of the quaternary epoch whose intention or significance is not known. Some are believed to have been religious symbols and emblems of authority. The natural color of all the wrought flints that belong to the earliest epoch of man's existence is gray, from the brightest to the darkest tint; but argillaceous soils color them white, and ochreous gravels yellowish brown. The proof of their age is the *patina*, which is the established term for those which are white on one side and brown on the other, probably from having lain between two different beds. To guard against fraud and to detect modern imitations of ancient stone implements, it is well to notice whether the flints are coated with branching crystallizations, called *dendrites*, of a dark brown, produced by the combined action of the oxides of iron and manganese generally contained in fossiliferous beds.—The finds which are assigned to the second division of the stone age, the epoch of the reindeer or of migrated existing animals, consist of flints which bear marks of more skilful workmanship, and implements in bone, ivory, and reindeer horn, not found in caves where human bones were mixed up with those of animals. Little splinters of bone, one or two inches long, straight, slender, and pointed at both ends, have been found among the deposits of Bruniquel and the Dordogne valley, and are believed to have served as fish hooks during this epoch. Numerous instruments have been found which must have been used as needles, as they are exactly like those now employed by the Lapps for the same purpose. Prof. Owen thinks the men of this period were anthropophagists, because human skulls have been found mixed up with sculptured flints, remains of pottery, and children's bones on which there seem to be traces of human teeth. To this period are also assigned the polishers, formed of sandstone or some other material with a rough surface; they were used for polishing bone and horn. Other objects classified as belonging to this age are barbed dartheads or harpoons; small flint saws, fine-toothed and double-edged; bone bodkins or stilettoes, either with or without a handle; smoothers, probably intended to flatten down the seams in the skins used for garments; flint points with a cutting edge, probably used as drills; whistles made from the first joint of the foot of a reindeer; staves of horn, which were perhaps symbols of authority; earthen vases and urns, which at the bottom bear traces of the action of fire; and first attempts at art, as sketches of mammoths graven on slabs of ivory, hilts of daggers carved in the shape of a reindeer, and representations of bisons, stags, and unknown herbivorous animals. The most important places where finds of such articles have been made are the grottoes and caves near Finale on the road from Genoa to Nice; a cave on a mountain near Geneva; the bottom of an ancient glacier moraine not far from the lake

of Constance; the caverns at Solutré, Bourdeilles, Laugerie-Basse and Laugerie-Haute, Abbeville, Les Eyzies, Chaffant, La Madeleine, Lavache, and Bruniquel, in France; the cave of Chaleux, the settlements on the banks of the Lesse, the cave near Turfooz, in Belgium; and the gravel beds of Colorado and Wyoming, the loess of the lower Mississippi valley, and the Osage and Bourbeuse valleys, in North America.—The third epoch of the stone age, with domesticated animals of existing species, which is also designated as the polished stone epoch, is believed to embrace the finds made in the *kjoekken-moeddings* (Dan. *kjoekker*, kitchen; *moedding*, heap of refuse), or kitchen middens, principally in Scandinavia, but also discovered in Cornwall and Devonshire, England, in Scotland, and near Hyères, at St. Valery, department of Pas-de-Calais, at La Salle, and at Cronqueleta, in France. Darwin met with them in Tierra del Fuego; Dampier in Australia; Pereira da Costa on the coast of Portugal; Lyell on the coasts of Massachusetts and Georgia; and Strobel on the coast of Brazil. Numerous finds assigned to this epoch have also been made in the caves of Old Castile and the provinces of Seville and Badajoz in Spain, in the neighborhood of Civit  Nuova in S. Italy, and in the island of Elba. Polished stone implements have also been found in W rtemberg, Hungary, Poland, and Russia. Leguay found in 1860 near Varenne-Saint-Hilaire, at a spot called La Pierre au Pr tre, a complete polishing stone, having on its surface three depressions of different sizes, two well defined grooves, and one merely sketched out. The polishing of stone instruments was effected by rubbing the object in one of these cavities, in which probably a little water was poured, mixed with zircon or corundum powder, or perhaps merely with oxide of iron, which is still used by jewellers for the same purpose. Finds of numerous hatchets and other polished instruments, near the fragments of several polishing stones, have given rise to the supposition that at this epoch there were regular workshops in which weapons and implements were manufactured. In the kitchen middens were found flat hatchets, cut squarely at the edge; drilled hatchets variously combined with a hammer; double-edged axes and axe hammers, pierced with a round hole in which the handle was fixed; beautiful spear heads in the shape of a laurel leaf, flat, and chipped all over with great art, which were evidently fixed to staves; poniards with handles sometimes covered with delicate carving; arrowheads of various shapes; chisels somewhat in the form of a quadrangular prism; small stone saws, in the shape of a crescent of which the inner edge, which was either straight or concave, was skilfully serrated; and various ornaments, as necklaces made of small pieces of amber, perforated and strung. The instruments of stag's horn found in the valley of the Somme are also considered as belonging to this epoch. Particularly interest-

ing relics are the pieces of polished flint half buried in a kind of sheath of stag's horn. The middle of the sheath is generally perforated with a round or oval hole, probably intended to receive a wooden handle. Sheaths have also been found which are not only provided with boars' tusks, but are hollowed out at each end so as to hold two flint hatchets at once. In the peat bogs of Abbeville have been discovered long bones belonging to mammals, as the tibia, femur, radius, and ulna, all cut in a uniform way either in the middle or at the ends, which were probably used as handles for flint implements. Near Pecquigny were found 19 boars' tusks split into halves, perfectly polished, and perforated at each end with a round hole. Through these holes was passed a string of some tendinous substance, the remains of which, it is said, were actually seen at the time of the discovery. In the caves of Ariège were found more than 20 stones which could only have been used for grinding corn. According to John Buchanan, quoted in Lyell's "Antiquity of Man," the canoes which were found in the low ground on the margin of the Clyde at Glasgow, as well as other boats found at the bottom of the Swiss lakes, and in Belgium and France, were formed of a single trunk of oak, hollowed out with some blunt instruments, probably stone hatchets, assisted by the action of fire; for which reasons it is believed that these finds must also be classified as belonging to this epoch of the stone age. Finds of stone implements similar to those described have been made in the vicinity of Alton, Illinois; Jackson, Laporte, Sullivan, and Crawford counties, Indiana; in a shell heap on the bank of the Grand lake, Louisiana; in Paris, Wisconsin; and a few in Kentucky.—*Metallic Age.* The principal places of deposit of articles assigned to the bronze epoch of the age of metals are the lacustrine habitations of Switzerland and other parts of Europe, and the palustrine villages of northern Italy. Numerous finds of articles belonging to this epoch have also been made in other prehistoric human habitations, and in tombs, in Scandinavia, the British isles, France, Switzerland, and Italy. The Danish bronze swords had hilts firmly fixed to the blade by means of two or more rivets, and some of them were splendidly ornamented. A bronze knife has been found with a handle in the form of a human figure executed with much fidelity. Several razors have been discovered, of which the blades were overloaded with ornaments. A very important find was made in 1861 in a tumulus in Jutland, of three wooden coffins, closed with movable lids, each of which contained a woollen cloak, a shawl, and a cap, and at the feet of the body two pieces of woollen material which seemed to be the remains of gaiters; each also held a sword, a knife, a bodkin, an awl, a pair of tweezers, a double button, a ball of amber, and a flint spear head. The shape of the sword and the knife indicates that the deposit belongs to the latter part of

the bronze epoch. Various objects found in dwellings belonging to this epoch appear to have been religious symbols. Most of them have a shape bearing some relation to a circle, and many authors have attributed them to the worship of the sun. Crosses belonging to this and even to the stone age are also sometimes met with. The figure of a triangle found on various objects in bronze is also believed to bear some relation to certain religious ideas.—For the finds made in North America another epoch, of a special character, has to be presumed. In 1847 Mr. Knapp discovered in the Ontonagon region on Lake Michigan, under an accumulation of earth, a vein of native copper, containing a great number of stone hammers. One of the diggings brought to light some great diorite hatchets which were worked by the aid of a handle, and also large cylindrical masses of the same substance hollowed out to receive a handle. Copper wrought into various utensils is found in the mounds all the way from Wisconsin to the gulf coast. Squier and Davis discovered in a mound near Chillicothe several round shells of mica 10 or 12 in. in diameter, overlapping like the scales of a fish. A find of 250 mica plates was made in the Grave creek mound. Many of the implements of these mound builders of the age of copper seem to have been wrought also of a ribbon-marked silicious stone. Squier and Davis found a deposit of obsidian arrowheads in Ohio, and Mr. Perkins one in Wisconsin.—*The Iron Epoch.* The finds assigned to this epoch consist of instruments of iron or bronze, or of iron combined with bronze instead of stone, articles of silver and lead, specimens of improved pottery, and coins. The most valuable finds have been made in the vast burial ground recently discovered at Hallstadt, near Salzburg, in Austria. The swords found there have iron blades and bronze hilts. The warriors' sword belts are generally formed of plates of bronze, and embellished with a *repoussé* ornament executed with a hammer. Several necklaces with pendants, and hundreds of bracelets, hair pins, and bronze fibulæ, all wrought with taste, have also been found here. Nearly 200 bronze vessels have been discovered, some of which are 36 in. high. Some of these vessels were carefully riveted, but not soldered. A find of glass vessels was also made in the same place, and remains of pottery were abundant. The ivory objects found were heads of hair pins and pommels of swords. The helmets resemble those worn by Gallic soldiers. In the tombs on the plateau of La Somma, in Lombardy, were found vases of fine clay, evidently wrought on the potter's wheel, ornamented with various designs, and containing ashes. Near Bern, at a spot called "the battle field of Tiefenau," because it appears to have been the theatre of a great conflict between the Helvetians and the Gauls, a find was made of about 100 swords and spear heads, fragments of coats of mail, rings, fibulæ, tires of chariot wheels, horses' bits, and

coins in gold, silver, and bronze. The only agricultural implements found in places of deposit of an undoubted prehistoric date, are scythes and sickles, and a mill composed of two stones resembling somewhat the *pistrinum* of the Romans. No implement of iron has been found in connection with the ancient civilizations of America. The mound builders appear to have wrought the rich specular ores of Missouri in the same manner as stone.—*Prehistoric Monuments.* Fergusson, in "Rude Stone Monuments," places little confidence in the classifications hitherto followed as a basis for establishing any historical relation with the human beings who used the objects discovered, or even for determining who they were. He proposes to classify finds according to the character of the places where they are made, and especially the degree of art exhibited in the structure of the prehistoric sepulchres from which nearly all the antiquarian objects have been taken. He maintains that the peculiarities of the mode of honoring the dead distinguish the races of mankind as definitely as speech. He classifies prehistoric sepulture as follows: I. Tumuli. *a.* Barrows of earth only. *b.* With small stone chambers or cists (microlithic). *c.* With chambers or dolmens formed of large stones (megalithic). *d.* With external access to chambers. II. Dolmens. *a.* Free standing dolmens without tumuli. *b.* Dolmens on the outside of tumuli. III. Circles. *a.* Circles surrounding tumuli. *b.* Circles surrounding dolmens. *c.* Circles without tumuli or dolmens. IV. Avenues. *a.* Avenues attached to circles. *b.* Avenues with or without circles or dolmens. V. Menhirs. *a.* Single or in groups. *b.* With oghams, sculptures, or runes. The earliest mode was simple inhumation, and if the deceased was of some importance a mound was raised over the grave. A sort of coffin was probably next devised, as seen in the rude cists so commonly found. In wooded countries the coffin was of wood, and, if the mound is old, perished long ago. Cists were expanded into chambers, to which at a later age passages for access were made. From the chambered tumulus sprung elaborate domed structures of either megalithic or microlithic architecture. The history of megalithic remains begins with the rude stone cists, generally called kistvaens, which by degrees became magnified into chambers, the side stones increasing from 1 ft. in height to 5 ft., and the capstone becoming a really megalithic feature, 6 to 10 ft. long by 4 or 5 ft. wide, and of considerable thickness. Many antiquaries insist, however, that all the dolmens (Celtic, *dau*, a table, and *men* or *maen*, a stone) or cromlechs (Celtic, *crum* or *crom*, crooked or curved, and *lech*, a stone) which are now standing free were once covered and buried in tumuli. The stone circles appear to have been introduced as substitutes for the circular earthen mounds which surround the early tumuli. They frequently enclose also dolmens, either standing on the level plain or on tumuli;

but they are often found enclosing nothing that can be seen above ground. It is believed that the larger circles, more than 100 ft. in diameter, were not sepulchral, but cenotaphic, or temples dedicated to the honor or worship of the dead. The avenues are rows of stones, sometimes leading to circles, and are also designated as alignments or parallellitha. Those of the first class represent externally the passages in tumuli which lead to the central chamber, but it is difficult to divine the use of the avenues which are not attached to circles and do not lead to any important monuments. The menhirs, or tall stones (Celtic, *men*, stone, and *hir*, high), are stone pillars, with or without inscriptions, which gradually superseded the earthen tumuli as a record of the dead.—Of the conclusion that may be drawn from the character of finds in regard to the culture of the contemporary races, E. B. Tylor says: "The exclusive use of stone, bone, &c., for cutting and piercing implements, is in general a criterion of savage culture, though compatible with the settled and comparatively advanced state of the early Swiss lake dwellers. 2. Bronze-making indicates a more advanced and systematic civilization, up to the level of the Mexicans and Peruvians in modern, and the Aryan races in ancient times. 3. Iron-making is indispensable to high culture, but from the facility of its adoption is not of itself a proof of anything beyond a high savage state affected by intercourse with still higher conditions."—*Human Remains.* These have been found in surprisingly small numbers. Lyell explains their scarcity as the effect of nature's plan of disencumbering habitable areas of skeletons by means of "the heat and moisture of the sun and atmosphere, the dissolving power of carbonic and other acids, the grinding teeth and gastric juices of quadrupeds, birds, reptiles, and fish, and the agency of many of the invertebrata." The human remains regarded by eminent archaeologists and osteologists as the oldest so far discovered are the fragments of the skeleton found in the Neanderthal cavern, near Düsseldorf, Germany; the fragments of a skull from Brúx, Bohemia; similar fragments of the Engis cave near Liège, Belgium; and the skeletons from a tumulus at Borreby, Denmark. The Neanderthal skull resembles that of Brúx, but is so extremely different in appearance from that of Engis, that according to Huxley it might be supposed to belong to a distant race of mankind. Schaaffhausen and Busk speak of it as the most brutal of all known human skulls, and as greatly resembling those of apes. One of the Borreby skulls has also this resemblance, but the others are said to exhibit a much higher conformation. The Engis skull is deemed a near approach to the Caucasian type, and appears to possess at the same time a more decided claim to antiquity than that of the Neanderthal. The Borreby skulls belong to the stone period of Denmark, and the people to

whom they appertained were probably either contemporaneous with or later than the makers of the kitchen middens. The Engis skull was found in one of the numerous bone caves which border the valley of the Meuse, where the remains of a number of human individuals were discovered, mingled with the bones and teeth of extinct quadrupeds, and with rude stone implements. Dupont in 1864 excavated 48 other caves in the valleys of the Lesse and the Meuse, and discovered in 25 of them numerous human remains, which he has divided into the mammoth, the reindeer, and the neolithic or polished stone period. Schaaffhausen, in his exhaustive treatise *Ueber die Urform des menschlichen Schädels* (Bonn, 1868), argues that the individual to whom the Neanderthal skull belonged must have had a small cerebral development, and uncommon strength of corporeal frame. One of the chief objects of the investigations as to the age of these remains is to determine whether man is preglacial or post-glacial. There is some reason for believing him to be pre-glacial, but not older than the later half of the pliocene period. In 1868 Desnoyers found near St. Prest fossil bones which some consider as coexistent with the *elephas meridionalis*, while others regard them as comparatively modern. The genuineness of the fossil man of Denise, found in central France, and alleged to have been contemporary with the same extinct animal, is questioned. The human bone of Natchez, Mississippi, which was accompanied by bones of the mastodon and megalonyx, is supported by insufficient scientific testimony; and the human remains in the loess near Maestricht, and near Strasburg, are assigned but hesitatingly to any very remote period of antiquity. The human remains found in the caves of Languedoc associated with bones of extinct mammalia, and those discovered in March, 1872, by Dr. Rivière in a cave at Mentone, near Nice, may be safely considered as belonging to the post-pliocene period. The antiquity of the human bones in Belgium, as Dupont has shown in his work *Les temps antéhistoriques en Belgique* (Brussels, 1871), can also be accepted as dating from times anterior to the neolithic age. Count Pourtales found human remains on the shores of Lake Monroe, in Florida, but as yet no date can be positively assigned to them. Many hypotheses have been put forward on the presumptive migrations of the prehistoric races; but in the present state of our knowledge no satisfactory conclusion can be reached. Quatrefages considers the pre-Aryan races which are typified by the human remains in the caverns of France as belonging to the Finnish family; Schaaffhausen is very decided in classifying them with the Celts; Schmerling speculates on Ethiopian affinities; and Huxley sees many analogies between these ancient inhabitants of Europe and the form, condition, and habits of the Australian races.—Besides the works referred

to above and in the articles on AMERICAN ANTIQUITIES, ARCHEOLOGY, BONE CAVES, and LAKE DWELLINGS, see Olfers, *Lydische Königsgräber* (Berlin, 1859); Lindenschmitt, *Die Alterthümer unserer heidnischen Vorzeit* (1868 et seq.); Lartet, *Cavernes du Périgord, objets graves et sculptés des temps préhistoriques dans l'Europe occidentale* (Paris, 1864); Don Gonzaga y Martinez, *Antigüedades prehistoricas* (Madrid, 1868); Figuier, "Primitive Man" (1870); Virchow, *Die altnordischen Schädel in Kopenhagen* (Berlin, 1871); Fergusson, "Rude Stone Monuments of all Ages" (London, 1872); Evans, "Ancient Stone Implements" (London, 1872); Foster, "Prehistoric Races of the United States" (Chicago, 1873); and Rivière, *Découverte d'un squelette humain de l'époque paléolithique* (Paris, 1873).

FINGAL'S CAVE, a grotto on the S. W. coast of the islet of Staffa, Argyleshire, Scotland, 7 m. off the W. coast of Mull, probably called after Fingal, the legendary hero of Gaelic poe-

Fingal's Cave.

try. It is formed by lofty basaltic pillars, and extends back from its mouth 227 ft.; its breadth at the entrance is 42 ft.; at the inner end, 22 ft. The sea is the floor of the cavern, and is about 20 ft. deep at low water. The main arch has been compared to the aisle of a great Gothic church; the columnar side walls are of stupendous size, and there are stalactites of a great variety of tints between the pillars. It is easily accessible, except at extreme high tide, by small boats. The height

from the top of the cliff to the summit of the arch is about 80 ft., and from the latter to the water at mean tide about 60 ft. Broken columns form the causeway on the E. side, and conceal the lower parts of the front columns, so that these seem to be only 18 ft. high, while the W. pillars are twice as high. The length is more than 200 ft. The sides are columnar like the front, and nearly perpendicular, but the irregular grouping and the fragmentary condition of the columns impair the symmetry of their appearance. There are several other remarkable caves in the island of Staffa.

FINISTÈRE, or *Finistère* (Lat. *finis terre*, land's end), the extreme W. department of France, in Brittany, surrounded on three sides by the ocean and the English channel, and bounded E. by the departments of Côtes-du-Nord and Morbihan; area, 2,595 sq. m.; pop. in 1872, 642,698. The coasts, generally steep and deeply indented, are about 400 m. in length, and present many excellent bays and harbors. The most important ports are Brest, Morlaix, Landerneau, Quimper, and Douarnenez. Of numerous rivers only the Aulne, the Elorn, and the Odet are navigable. Two hill chains, that of Arès in the north and that of the Black mountains in the south, run through this department E. and W. The climate is mild, but humid; fogs are common; W. winds are most prevalent, and violent storms often occur. The soil of some parts is good, and the pasturage is excellent; but heath or waste land covers no less than a third of the area, and agriculture is in a backward state. The wealth of the department consists especially in its mines of argentiferous lead; those of Poullaouen and Huelgoat are perhaps the largest in France. Iron, zinc, coal, and bitumen are also mined. The fisheries are very important. There are manufactories of linen and woollen fabrics, paper mills, rope yards, and sailcloth and earthenware factories. The department is divided into the arrondissements of Quimper, Brest, Morlaix, Châteaulin, and Quimperlé. Capital, Quimper.

FINK, or *Flack*, *Friedrich August von*, a Prussian soldier, born at Strelitz in 1718, died in Copenhagen, Feb. 24, 1766. He had gained experience in the Austrian and Russian service previous to entering the Prussian army as major in 1748. He was advanced by Frederick the Great to the rank of lieutenant general, and was employed in 1759 to coöperate with the king's brother in Saxony, the chief command being subsequently intrusted to him. After the capitulation of Dresden to the Austrians (Sept. 4), Fink was ordered by the king to Maxen to cut off the enemy's retreat, but was surrounded and overwhelmed by vastly superior forces, and obliged to surrender (Nov. 20). On his return from Austrian captivity he was court-martialled, and, though he had anticipated the Maxen disaster by representing to the king the inadequacy of his resources, was sentenced to a year's imprisonment in the fortress of Spandau.

After his release he begged to be dismissed from the Prussian service, and in 1764 became general of infantry in the Danish army. But he felt wronged by the Prussian king's inexorable rigor, and died broken-hearted.

FINLAND (Fin. *Suomenmaa*, region of lakes), a grand duchy in the northwest of the Russian empire, lying between lat. 59° 45' and 70° N., and lon. 20° 50' and 32° 50' E., bounded N. by the Norwegian province of Tromsø, E. by the Russian provinces of Archangel and Olonetz, S. by the gulf of Finland, and W. by the gulf of Bothnia and Sweden; area, 184,830 sq. m. The name of Finland was given to it by the Swedes. The läns or governments and their population in 1867 were as follows:

Nyland	174,898
Abo-Björneborg	819,754
Tavastehus	170,264
Viborg	279,944
St. Michael	161,586
Kuopio	226,670
Vasa	818,169
Uleaborg	154,766
Total	1,830,886

The population comprises 125,000 Swedish Finns, 8,000 Russians, 1,000 Lapps, 1,000 gypsies, and 400 Germans, the rest being Finns proper. In December, 1870, the population amounted to only 1,732,621, showing a considerable decrease since 1867; as in several years, in consequence of famine and epidemics, the number of deaths largely exceeded that of births. There are 34 towns with an aggregate population of 185,000, constituting only 7.5 per cent. of the total population, a smaller percentage than is found in any other country of Europe. The most populous districts are along the coast; there are some tracts in the interior wholly uninhabited. The population of the whole country is about 13 to the square mile. —The S. coast of Finland is bordered with rocky islets, between which and the mainland are narrow and intricate channels difficult of navigation. The W. coast is generally low, but becomes very rocky near the Quarken, and in some parts is not less dangerous than the southern. Some of the islands, as those of Sveaborg, which command the entrance to the harbor of Helsingfors, are strongly fortified. The rivers are few and unimportant; the principal is the Kymmene, which flows into the gulf of Finland, and is broad and deep, but owing to cataracts is not navigable. The lakes, however, constitute a prominent feature in the geography of the country, being very numerous and occupying a large proportion of the territory. Independently of Lake Ladoga, which lies partly in Finland, the largest of these sheets of water are Lakes Saima and Enare. The communication between the various water-sheds and the Finnish gulf has been established since 1854 by the lake of Saima. The surface is table land from 400 to 600 ft. above the level of the sea, with occasional higher elevations. The Maan Selkä mountains, which with their

various branches traverse the north, rise to an altitude of about 2,400 ft. The principal geological formation is red granite with hard limestone and slate. The granite is soft and readily disintegrates. The soil is poor and stony, but long furnished considerably more grain than was required for home consumption. The climate is more severe than that of Sweden, although resembling it in many other respects. Dense fogs are frequent, and the rains in autumn are very heavy. In the southern provinces the winter lasts seven months. In the northern the sun disappears in December, and is not seen again until the middle of January; but during the short summer it is almost continually above the horizon.—The mineral products comprise bog iron, ~~lead~~, sulphur, arsenic, and a little copper ore. Salt is very scarce, and is one of the principal articles of importation. The entire mineral produce of the country was in 1870 valued at \$1,152,245. Among the fauna are the bear, wolf, elk, deer, beaver, polecat, and various kinds of game. Large herds of reindeer are domesticated in the north, and cattle breeding is a prominent branch of industry. Seals and herrings are caught off the coasts, and the lakes and streams abound in salmon and a small species of herring which form an important part of the food of the inhabitants. Finland was formerly called the granary of Sweden; but since the Russian conquest agricultural production is said to have declined. The chief crops are barley, rye, hops, hemp, flax, oats, leguminous plants, and potatoes. A little tobacco, carrots, colewort, parsnips, and onions are also grown. Wild berries are almost the only fruit. The forests are extensive, reaching N. to lat. 69°, consisting principally of pine and fir, but containing also beech, elm, oak, poplar, ash, and birch. These forests are one of the chief sources of national wealth, but have been much wasted by a system of manuring land with their ashes. The soil requires frequent stimulus, and when the cleared land ceases to produce sufficiently it is abandoned for other portions of soil, the timber of which is purposely burned. Much tar, pitch, and potash, however, as well as firewood, are still exported. The pasture lands are good, but ill managed.—Manufactures are chiefly domestic. The peasant prepares his own tar, potash, and charcoal, builds his own boat, makes his own chairs and tables, and in his cottage are woven the coarse woollen and other fabrics of which his dress is composed. But there are several cotton manufactories. In 1865 there were in Finland 32 manufactories of tobacco, 19 of glassware, 7 of paper, and various others. The aggregate produce of the Finnish manufactures in 1865 was valued at \$2,962,880; the number of workmen employed was 6,946. The exports of Finland amounted in 1870 to \$8,514,720 (\$3,200,000 to Russia), and the imports to \$7,848,480 (\$2,769,600 from Russia). The chief articles of export were timber and wooden ware, butter, iron,

corn, tar, and fish; the chief imports were coffee, iron, sugar, raw cotton, salt, tobacco, wine, and brandy. Of foreign countries, England ranks first as regards the exports of Finland, and Germany first as regards its imports. Finland has two banks: one national bank, *Finlands Bank*, established in 1811, and administered since 1868 by deputies of the diet; and one private, *Föreningsbanken i Finland*, founded in 1862, which in 1870 had branches in 17 towns. The commercial marine consisted in 1870 of 78 steamships and 504 sailing vessels, of 81,352 tons, manned by 5,742 sailors. The largest number of commercial vessels is owned by the town of Brahestad; next in order follow Åbo, Nystad, Vasa, Uleåborg, and Jakobstad. Not included in the above number are 1,109 coasting vessels, of 52,054 tons. There is regular steamship connection all along the coast from St. Petersburg to Tornea, as well as on most of the lakes in the interior of the country. There are 14 lighthouses and 740 pilots distributed among 97 stations. The first railway was opened in 1862 between Helsingfors and Tavastehus; in 1870 the railway between St. Petersburg and Helsingfors was completed, and in 1874 that between the former city and Hango. The entire length of the Finnish railways in 1871 was 298 m., of telegraph lines 1,686 m., and of telegraph wires 2,758 m. In 1869 a submarine telegraph was laid between Sweden and Finland, *via* the Åland islands.—With the exception of 41,000 Greek and 800 Roman Catholics, nearly the whole population are Lutherans, divided into three dioceses. The archbishop resides at Åbo, the two bishops at Borgå and Kuopio. Education receives considerable care, and the study of the Finnish language, which was much neglected while the country was subject to Sweden, is encouraged by the Russian government. Besides the Alexander university, transferred from Åbo to Helsingfors, there are six gymnasiums, 13 superior elementary schools, and a military academy, and most of the parishes have primary schools. In 1864 a Finnish normal school was established at Jyväskylä; and in 1871 the establishment of two Swedish normal schools, one male and one female, was ordered. In 1872 the study of the Russian language in all state schools was made compulsory; up to that time it had been optional, and, from the aversion of the Finns to all that is Russian, generally neglected.—Since 1809 Finland has been united with the empire of Russia. Its fundamental laws are the Swedish constitution of 1772, and the act of union of 1789. These were confirmed by the emperor Alexander I., March 27, 1809; again by the emperor Nicholas, Dec. 24, 1825; and by Alexander II., March 4, 1855. The right of representation was regulated anew by a law in 1869. The government is administered by a governor general and a senate consisting of 14 members, half of whom are noble, and who are presided over by the governor general assisted by two vice presi-

dents not included in the number of the members. The senators are named for three years by the emperor. The vice presidents are chiefs of the departments of justice and finance. The deliberations of the senate are held at Helsingfors, the modern capital. High courts of justice sit at Abo, Vasa, and Viborg. There is also a regular military court. Provincial governors reside at Helsingfors, Abo, Tavastehus, Viborg, St. Michael, Kuopio, Vasa, and Uleaborg. These dignitaries are all, by the terms of the constitution, Finns, and a secretary of state for Finnish affairs resides at St. Petersburg, and is a member of the imperial council. A diet, composed like the former diet of Sweden of the four orders, nobility, clergy, burghers, and peasants, is a constitutional privilege of Finland, according to the imperial recognition. The troops of the army as well as of the navy consist of men who volunteer for a term of six years. In 1872 Finland had only a battalion of sharpshooters, consisting of 679 men; the marine troops numbered 100 men. The revenue in the general budget for 1871 amounted to \$3,058,370, of which \$368,440 were from real estate, \$1,322,092 from customs, stamps, &c., \$500,166 from casual dues, and \$240,000 from tax on brandies, &c. The expenditures amounted to \$2,736,499, of which \$575,076 were for the civil administration, \$205,440 for government, \$475,937 for agriculture and commerce, and \$512,110 for extraordinary expenditures. The revenue and the expenditure of the military budget amounted to \$492,788 each. The clergy, part of the troops, and various civil functionaries receive their emoluments and pay from resources not included in the foregoing list of revenue; namely, from country parishes, or from government lands reserved for this purpose. These expenditures therefore do not appear in the general budget. The debt of the state in 1871 amounted to \$8,309,000.—Less is known of early Finnish history than of that of any other European country. The inhabitants, pagans, were governed by their own independent kings until about the middle of the 12th century. Their piracies at this period so much harassed the Swedes, that St. Eric, king of the latter people, undertook a crusade against them, and introduced Christianity, and also probably planted Swedish colonists upon their coasts. The Swedes thus acquired a hold upon the country which they retained for several centuries. From this period down to 1809 the history of Finland is included in that of the kings of Sweden, during which the country was the frequent scene of Russian and Swedish wars. By the peace of Nystad (1721), three years after the death of Charles XII., the territory of Viborg, the eastern division of Finland, became definitively Russian. In 1741 the Swedes, hoping to repair their losses, declared war, but in a few months the whole of Finland was overrun by the Russians. In the following year, at Abo, Sweden ratified anew

all her former cessions, yielding additional territory also, but recovered the principal duchy. In 1787 Gustavus III. began his great attempt to recover these losses and to humble his antagonist; but the results of the war added little glory to the Swedish arms. In 1808 a fresh invasion from Russia took place, and Sweden purchased peace by the cession of all Finland and the islands of Aland, Sept. 17, 1809. The Swedish language and customs during 750 years had taken such firm root that Russian dominion has been unable to modify them. Abo remains in some degree a Swedish city, and the removal of the seat of government to its rival Helsingfors (1819), and of the university (1827), has not contributed to Russianize the ancient capital. Indeed, at the present day Stockholm is for Abo much what St. Petersburg is for Helsingfors. During the whole period from 1809 to 1863 the Finnish diet was not convoked by the Russian government. On Sept. 18, 1863, the emperor Alexander opened the diet at Helsingfors, composed of 48 representatives of the rural population, 80 of the towns, 32 of the clergy, and 141 noblemen. The emperor promised that he would coöperate with this diet in the introduction of reasonable reforms. Several resolutions of the diet of 1863-'4, as well as of those which met in 1867 and 1872, have been sanctioned by the emperor. Besides the new electoral law, already referred to, a new church law for the Lutheran church of Finland was published in 1869. A new press law which had been adopted by the diet in 1864 was promulgated in 1865, and was to remain in force only till 1867; but as the diet of 1867 failed to agree on the proposed amendments, it remained in force till 1872, when all the four estates composing the diet declared in favor of the liberty of the press, which the government refused to concede. On April 12, 1872, the customs frontier between Finland and Russia was abolished.

—LANGUAGE AND LITERATURE. The Finnish language (Finnish, *Suomen Kieli*) is one of the chief branches of the Uralo-Finnish family; being, with the Esthic and Lappic collaterals, kindred to the languages of the Ugrians or eastern Turks, Osmanli Turks, Samoyeds, Tartars, Magyars, Mongols, and Tunguses, whose chief branch is the Mantchoos. All these, with some other tribes, constitute the family variously designated as Scythic, Turanian, Allophylic, Mongolian, or Uralo-Altaic. (See ETHNOLOGY, FINNS, and TURANIAN RACE AND LANGUAGES.) The Kieli, which is spoken by more than 2,000,000 people, consists of many dialects, of which the principal are the lower, used along the coasts (except the islands and towns, where Swedes have settled), its Abo variety being the dialect used in books; the upper, or that of the inland region, divided into the sub-dialects of Ulea and Viborg, and the varieties of Karelia, Ingria, &c. The Suomic language is written with 23 Latin or German letters, of which two are repeated at the end of

the alphabet with a diacritic sign, viz., *ä, ö*. It contains, however, but 19 genuine sounds, viz., 8 vowels and 11 consonants. The letters *b, c, d, f, g* occur only in a few foreign words and in some dialects. *K, p, h* are the most frequent initials, *k, p, t* the most frequent consonants, and sound a little softer than in other languages. The concurrence of consonants is avoided, so that the foreign words *Francois, Stephen, school, stable* become *Rantsi, Tehoan, koulu, tallia*. There are many diphthongs. Long vowels are written double. The hiatus is not avoided. A few themes end in consonants, but none in *m*. The rhythm of the language is trochaic, and the root bears the tone. Rask considers the Suomic to be the most harmonious of tongues. The radical, which precedes all other syllables, never undergoes any change in its beginning and middle. The theme is originally dissyllabic, and often corresponds to monosyllabic Magyar roots; thus: *käsi*, Magyar *kéz*, hand; *sata*, *sáz*, 100; *vesi*, *víz*, water; *veri*, *vér*, blood; *sana*, *szó*, word; *tyvi*, *tő*, stem, &c. The various relations of nouns to one another, which in other languages are expressed both by cases and prepositions, are indicated by post-positions or suffixes, forming from the nominative, which is sometimes the theme with a changed final, 14 cases, of which 7 are simple, the others more full. There are two declensions. The object is indicated by the genitive, nominative, or partitive, according to the shade of meaning. Plurality is denoted for the nominative by suffixing *t*, and for the other cases by inserting *i* before their endings. In some instances a euphonic *e* is inserted before the endings. Vocal harmony is strictly observed between the vowels of the theme (in nouns as well as verbs), and for this purpose the vowels are distinguished into three groups, viz.: *a, o, u; e, i; and ä, ö, y*; those of the first and last never occurring in one word together, but being compatible with those of the middle one. Hence the vowels of the first and last group are converted reciprocally in the suffixes, in order to suit the vowels of the theme; for instance, *maa-ta*, land-part, but *pää-tä*, head-part. No language of this family has grammatic genders, but all indicate sexes either by distinct words or by epithets. The Magyar alone uses an article. The adjectives in Suomic are immutable, and are rendered comparative by suffixing *mpa*, *mma*, *mlu*, and superlative by inserting *i* before that termination. Nouns and adverbs receive an intenser meaning by inserting *mpa* and *impa*. The numerals are: 1, *yksi*; 2, *kaksi*; 3, *kolme*; 4, *neljä*; 5, *viisi*; 6, *kuusi*; 7, *seitsemän*; 8, *kahdeksan*; 9, *yhdeksän*; 10, *kymmenen*; 11, *yksi-toista-kymmentä*; 20, *kaksi-kymmentä*; 30, *kolmi-kymmentä*; 100, *sata*; 1,000, *tuhanen*, *tuhot*. The personal pronouns are: *minä*, I; *sinä*, thou; *hän*, he, she; *me*, we; *te*, you; *he*, *hevat*, they. The possessive is formed by a suffix, as *isä*, a father; *isäni*, my father; *isäsi*, thy father; *isänsä*, his father; *isämme*,

our father; *isänne*, your father; *isänsä*, their father. The verbs have but two simple tenses, viz., the present and past, the others being periphrastic. Their conjugation is more complicated than in any other family of languages, expressing by certain syllables inserted between the theme and the personal suffixes all voices, modes, species, and other nice shades of meaning. The infinitive shares more than in any other language in the nature of a noun; it comprehends the Latin gerunds, supines, and other shades of sense, and is declinable. The Finnish language has no separable particles, and even affirmation is expressed by means of the auxiliary *olen*, I am, and negation by means of the verb *e*. By connecting several such significant syllables into one word, the most complicated ideas may be very precisely expressed, which often require many separate words in other languages. Derived words may be formed almost indefinitely. The construction is extremely free, as in Magyar, without endangering the clearness of the sense; as for instance:

<i>Katso</i>	<i>kytöjä</i>	<i>meni</i>	<i>kytöndään</i> ,	<i>ja</i>	<i>kytöitään</i>
Lo!	sower	went	sow-to,	and	sowing-while
<i>lantteivat</i>	<i>murumat</i>	<i>tien</i>	<i>ohien</i>	<i>ja</i>	<i>länut</i>
fell	some (seeds)	road's	edge-on,	and	birds
<i>tulivat</i> , <i>ja</i>	<i>öivät</i>	<i>ne</i> .			
came	and	picked-up	them.		

The best grammars of the language are those of Juden (Viborg, 1818) and Koskinen (Åbo, 1865), in Swedish. Finnish dictionaries have been published in Latin and Swedish by D. Justenius in 1745, Renvall in Latin, Swedish, and German (Åbo, 1826), O. Helenius in Swedish (Åbo, 1838), and E. Lönnrot (Helsingfors, 1858). —The national songs or runes of the Finns may be divided into mythological and lyrical songs. They are sung by *Runolainen* (song men), to the sound of the favorite national instrument, the *kantele*, a species of harp with five wire strings. They have also magic songs (*Luvut*), which are not sung but recited in a solemn measured tone. The songs, scattered among the people for generations past, and some of which had been published since the beginning of this century, were at length collected by Lönnrot and published at Helsingfors in 1835 under the title of *Kalevala*, which work is now regarded as the great national epic of Finland. So great was its success that the Finnish literary society took immediate measures for a more comprehensive collection, and the second edition, which appeared in 1849, contains 50 songs, with 22,790 verses, while the first edition contained only about half as many. A Swedish translation of the poem by Castrén (Helsingfors, 1844) was speedily followed by a French translation by Léouzou le Duc (2 vols. 8vo, Paris, 1845), and by a German translation by A. Schiefner (Helsingfors, 1852). Lönnrot has further collected about 600 ancient lyrical songs and 60 ballads (*Kanteletar*, Helsingfors,

1840); 7,077 proverbs (*Suomen kansan sanal-akkuja*, 1842); and about 2,200 charades (*Suomen kansan orwoituksia*, 2d ed., 1851); while Rudbäk has edited a collection of legends and tales (*Suomen kansan satuja*, Helsingfors, 1854), and Salmelainen has edited *Suomen kansan satuja ja tarinoita*, a collection of prose tales and proverbs (4 vols., Helsingfors, 1854-'62). There are many poets in Finland of Swedish descent, and Swedish works are often translated into Finnish. The most popular modern Finnish poet is a peasant named Paavo Korhonen. An edition of his songs was published at Helsingfors in 1848, under the auspices of Lönnrot. Next in rank is probably the poet Oksaselta, who published in 1860 *Säkeniä, kokous runoutta*. The prose literature of Finland was formerly devoted almost exclusively to religious and moral subjects. A Finnish translation of the New Testament by Michael Agricola appeared in 1548, and a portion of the Old Testament in 1552; but the whole Bible was not translated into Finnish until 1642. The literature of Finland has, however, passed through a remarkable development during the last few decades. There are now publications in the national tongue on almost every branch of scientific research. Works on linguistics have been published by Geitlin, Stjerncreutz and Rothman, Ahlman, and others; a translation of Tacitus's *Germania* by Blomstedt (1865), of the *Poema del Cid* by Estlander (1863), and of the Hindoo epos *Ramayana*, part *Sitaharanam*, by Donner (1865). Prominent historical works are: Yrjö Koskinen's *Nuija-sota*, &c. (1857 *et seq.*), Blomstedt's *Kapina Kauhajoella* (1862), and Pütz's *Yleisen historian oppikirja* (1865 *et seq.*). Krohn's *Suomenkielinen runollisuus ruotsinsvallon aikana* (1882) is a valuable contribution toward a history of Finnish literature. Periodical literature is well represented by *Maiden ya meren takaa* (since 1864) and the *Kirjallinen kuukaus lehti* (since 1866).

FINLAND, Gulf of, the eastern arm of the Baltic sea, extending from the S. W. extremity of Finland and Dagö island eastwardly to the bay of Cronstadt and St. Petersburg, between lon. 22° and 80° 18' E., and intersected by the 60th parallel of north latitude. It is 250 m. long, with a mean breadth of 60 or 70 m. Its coasts are entirely Russian possessions; namely, Finland on the north, and the governments of Esthonia and St. Petersburg on the south. Its E. extremity is the bay of Cronstadt, which is almost encircled by the shores of the last named government. The waters of the great lakes Onega and Ladoga, N. E. of St. Petersburg, flow into the gulf of Finland, the first by the river Svir into Lake Ladoga, and the latter by the Neva into the bay of Cronstadt. The bed of the gulf is of calcareous rock, in some parts compact and naked, in others covered and filled with shells. Occasional points of granite are intermingled with this general character. The depth of water is nowhere great, and is least along the southern

coast, of which the submerged descent is gradual. The northern shore is much hemmed in with islands and granite rocks. In its eastern parts, particularly between Cronstadt and St. Petersburg, are numerous sand banks and shallows. In addition to these the huge masses of ice which in spring and autumn block up the mouths of the rivers present a serious impediment to navigation. The water is very slightly salt, and is readily drunk by cattle. The harbors of the gulf of Finland are closed by ice every year from early in December to the middle or end of April. It has several times happened that the waters of the gulf, driven by westerly gales, have submerged whole streets in St. Petersburg, even up to the first floor of houses; an event against which no provision for the future has appeared possible.

FINLAY, George, a British historian, born at Glasgow in 1800, died Jan. 26, 1875. He enlisted in the Greek war of independence, and afterward resided in Athens, acting for many years as the special correspondent of the London "Times." He was noted for his thorough knowledge of Greek topography, art, and antiquity, and wrote a series of works on Greek history, comprising "History of Greece under the Romans" (1848; 2d ed., 1857); "History of Mediæval Greece and Trebizond" (1851); "History of the Byzantine and Greek Empires from 716 to 1057" (2 vols., 1858-'4); "History of Greece under Othman and Venetian Dominion" (1854); and "History of the Greek Revolution" (2 vols., 1861).

FINLAY, John, a Scottish poet and biographer, born in Glasgow in 1782, died at Moffat, Dec. 8, 1810. His principal poem, "Wallace, or the Vale of Ellerslie," was published when he was only 18 years old. The more important of his other works are: "Scottish Historical and Romantic Ballads, chiefly Ancient, with Explanatory Notes," &c. (2 vols., Edinburgh, 1808), and a "Life of Cervantes." He also edited Blair's "Grave" and Smith's "Wealth of Nations."

FINLAYSON, George, a British surgeon and traveller, born in Thurso about 1790, died on the passage from Bengal to Scotland in August, 1828. He was a surgeon in the British army, was present at the battle of Waterloo, and served in Ceylon and India. In 1821 he accompanied Crawford in his mission to the sovereigns of Siam and Hué (Cochin China), and wrote an interesting journal of it, which was edited and published after his death by Sir T. S. Raffles (London, 1825).

FINLEY, James Bradley, an American clergyman, born in North Carolina, July 1, 1781, died in Cincinnati, O., Sept. 6, 1856. He joined the Ohio conference of the Methodist Episcopal church in 1809. From 1816 to 1821 he was presiding elder of the Steubenville, Ohio, and Lebanon districts. In 1821 he was sent as missionary to the Wyandot Indians, where he remained six years. Retaining the superintendency of this mission for two years, he subse-

quently continued in the itinerant ministry as pastor and presiding elder till 1845, when he was appointed chaplain of the Ohio penitentiary. He retained this office till 1849. During his later years he acted as conference missionary and pastor of churches in southern Ohio. His chief works are: "Autobiography" (Cincinnati, 1854); "Wyandotte Mission;" "Sketches of Western Methodism" (1857); "Life among the Indians" (1857); and "Memorials of Prison Life" (1860).

FINLEY, Samuel, an American Presbyterian clergyman, born in Arnagh, Ireland, in 1715, died in Philadelphia, July 17, 1766. He arrived in America in 1734, studied theology, and was licensed to preach in 1740. The first part of his ministry was occupied with itinerant labors in promoting a revival of religion. In 1744 he was settled at Nottingham, Md., where he remained seven years, and carried on in addition to his ministerial labors an academy which acquired a high reputation. On the death of President Davies of the college of New Jersey, he was chosen his successor, and removed to Princeton in 1761. The college flourished while under his care.

FINMARK, a bailiwick of Norway, forming the N. E. division of the province of Tromsø, and the northernmost region of the continent of Europe, formerly including also what is now the bailiwick of Tromsø; area, 18,806 sq. m.; pop. in 1872, 20,329. It lies wholly within the arctic circle. Its northernmost point is the North cape, in lat. 71° 10'. Its coasts are thickly indented by long winding inlets, and are bordered by a vast number of irregular islands. It has important cod fisheries. The principal rivers are the Alten and Tana, the valleys of which are fertile and well cultivated. The climate of the coasts is so mild that some of the firds never freeze. Hammerfest, an active trading place, is one of the principal towns.

FINN, Henry J., an American actor and author, born at Sydney, Cape Breton, about 1785, perished in the conflagration of the steamboat Lexington in Long Island sound on the night of Jan. 13, 1840. He went to England in his youth, on the invitation of a rich uncle residing there, who died without making any provision for him, and he was obliged to resort to the stage for a support. After a few years he returned to New York, subsequently revisited England, and in 1822 made his first appearance at the Federal street theatre in Boston. He was one of the most popular actors on the stage, his forte being broad comedy. He accumulated a competency, and was on his way to his residence in Newport, R. I., at the time of his death. He enjoyed a considerable reputation as a humorous writer, and published a "Comio Annual" and a number of articles in the periodicals. He published a drama entitled "Montgomery, or the Falls of Montmorenci," which was acted with success, and he left besides a manuscript tragedy.

FINNEY, Charles G., an American preacher and author, born in Warren, Litchfield co., Conn., Aug. 29, 1792, died at Oberlin, O., Aug. 16, 1875. He studied law in Jefferson co., N. Y., but became a preacher in 1824, and labored as an evangelist with great success until 1835, when he accepted a professorship in Oberlin college, Ohio; and in 1837 he became pastor of the first Congregational church at Oberlin. He continued to preach in New York and elsewhere at intervals, and in 1848 went to England, where he remained three years. In 1852 he became president of Oberlin college, which position he held until 1866. His principal works are: "Lectures on Revivals" (Boston, 1835; 13th ed., 1840; new and enlarged ed., Oberlin, 1868); "Lectures to Professing Christians" (Oberlin, 1836); "Sermons on Important Subjects" (New York, 1839); and "Lectures on Systematic Theology" (2 vols. 8vo, Oberlin, 1847). All of these have passed through several editions.

FINNS, a race of men inhabiting portions of N. and E. Europe and N. W. Asia. The most important divisions of this race, besides the inhabitants of Finland or Finns proper, are the Lapps, Esths, Sirians, Permiaks, Votiaks, Tcheremisses, Mordvins, Bashkirs, Tchuvashes, Voguls, Ostiaks, and Magyars. They thus comprise the extensive group of languages and tribes which ethnologists and philologists designate as the Uralo-Finnic branch of the Mongolian, Turanian, or Uralo-Altaic family. (See ETHNOLOGY.) The Finns are related to the Huns, Avars, and Khazars; but it is not positively known when they took possession of their present habitats, and from what direction they moved into them. They are in every respect of the Mongoloid type, having not only its general physical character, but also its mental and temperamental characteristics. They are distinguished by the same gravity of demeanor and concealment of emotions; by deliberation of speech and the absence of violent gesticulation; by the rarity of laughter, and by plaintive and melancholy songs. It was until recently the universal opinion of ethnologists that they were a younger branch of the Asiatic Mongolians, and consequently that they emigrated from east to west. There are, however, reasons for supposing that the Finnic languages represent the oldest forms of speech among the Uralo-Altaic group. They possess, for example, the strongest marked features of the whole family, and bear the closest analogy to the Indo-European tongues. From these facts the conclusion has been drawn that the primitive Finns and Indo-Europeans were neighbors, and that the two families of languages were formed at the same time. The authorities who hold that the earliest home of the Indo-Europeans must be placed where the main body of them is still found, maintain accordingly that the Finns still inhabit their primitive soil, and that they are the ancestors and the stem of the Asiatic Turanians. One of

the least expected results of the decipherment of the Babylonian and Assyrian cuneiform inscriptions is that the most ancient language found in this style of writing is strongly allied to the idioms of the Uralo-Finnic race, and that many of its words and the greater part of its grammatical forms particularly resemble the Finlandish. It is therefore conjectured that the Finnic race was in possession of the Tigris and Euphrates basin more than 4,000 years ago; and in retracing the ideographs of the cuneiforms to the objects they originally represented, it is found that the region where this system of writing was invented was a northern clime; at least one totally different from that of Babylonia and Assyria, destitute, among other things, of large feline carnivora and of palm trees. The French ethnologist Quatrefages maintains in his recent work on *La race prussienne* that the Prussians proper are of Finnic descent, but apparently without sufficient evidence. Beloguet, on the other hand, argues, in his *Ethnologie gauloise*, that the pre-Aryan race which inhabited France must have been Finns; but this hypothesis also has no sufficient basis. Finnic elements are also discovered in the Basque language and in the remnants of the Etruscan. As Tacitus, however, speaks of Fenni among the German tribes, and as the Finnic languages are strongly intermixed with Celtic forms, it is probable that the Finns occupied at a remote time the low lands of Germany to the confines of Gaul. Certain it is that they inhabited for a long period the whole region between the Volga and the Ural rivers, and that the Magyar tribe dwelt in the district of the Kuma. The Finns also overran the southern portion of Sweden, and perhaps Jutland; but they were driven out of the country W. of the gulf of Bothnia as early as the 9th century.—The Finns of N. W. Russia belong either to the Greek or to the Lutheran church. Before the 12th century they adored numberless fetiches, besides a god of heaven and earth whom they called Yumala, Yumula, or Yumara, according to the dialect of the tribe, and also Num on the E. shore of the White sea. The other Finnic deities were tribal gods adopted in the course of migration and development. In Finland there are about 1,500,000 Finns proper, many of whom have adopted the civilization of the Swedes, their former conquerors, but are reluctant to become Russianized. The peasants of the interior still live in a very rude and simple manner. The dialect of this branch of the Finnic race is considered one of the most harmonious and softest languages spoken. (See FINLAND, LANGUAGE AND LITERATURE.) The Finns proper are subdivided into Tavasts and Karelians. The Tavasts, who inhabit the S. W. districts of Finland, are great agriculturists, besides paying much attention to breeding cattle. They are nevertheless one of the poorest and humblest branches of the whole race. They designate

themselves as *Flamalaiseth*, and are estimated to number about 600,000. More vivacious and less rude than the Tavasts are the Karelians, whom the other Finnish tribes call *Karialaiseth*. They inhabit the eastern portions of Finland and the adjoining governments of Russia, and number above 1,000,000. The Lapps are distributed over portions of Sweden, Norway, and Russia, and are only about 15,000 in number. In the government of St. Petersburg dwell nearly 18,000 Ingrians and about 5,000 Vots or *Vatialiseth*. The Esths, in Esthonia, Livonia, and the neighboring governments, number upward of 500,000; the Tchuds proper, in Olonetz and Novgorod, about 15,000; the Livs and Krevinga, in Courland and Livonia, are becoming extinct, numbering little more than 2,000 persons. All these together form the Tchudic branch of the race. The Permian branch occupies regions between the Ural mountains and the Volga and Dwina. There are about 50,000

Peasants of Finland.

Permiaks in the government of Perm, who without their Finnic language could scarcely be distinguished from the Russians. They raise cattle, are very poor, and their customs are similar to those of the Votiaks, who number about 180,000, and live in villages of 20 to 40 houses between the Kama and the Viatka. With the latter are mingled the Bissermians, about 5,000 in number, greatly resembling the Permiaks. The Sirians, between lat. 58° and 66° N., chiefly on the Vytchegda, number about 70,000, speak exclusively their own dialect, and belong to the Greek church. On the central Volga, and between that river and the Oka, dwells the Volgaic or Bulgaric branch, numbering more than 1,000,000, among whom the Mordvins, upward of 400,000, seem to be the

dominant class. The writers of the middle ages speak of the Mordvins as being very cruel, and accuse them of cannibalism. They are now considered intelligent, industrious, and honest; they cultivate the soil, and raise cattle and bees; they live in huts with the door opening to the east; and though they profess to be Christians, they are still given to many superstitious practices. Their dialect is similar to that of the Tcheremisses, whose language is strongly intermixed with Tartar and Russian. The Tcheremisses are scattered over the governments of Viatka, Kazan, Nizhni-Novgorod, and Kostroma, and are estimated at 150,000. Those living on the right shore of the Volga are called highland Tcheremisses, and others Tcheremisses of the plain. The Tchuvashes number about 450,000, and live in Kazan, Simbirsk, Saratov, and Orenburg. Their religion is neither Christian, Mohammedan, nor pagan, but a mixture of the three, with paganism in the ascendant. The principal tribes among them are the Vereyal and the Kereyal, and their chief occupations are agriculture, bee culture, and cattle raising. The abodes of the Ugrie branch are widely distributed. The Ugrian tribe proper and the Ostiaks live in the neighborhood of the Samoyeds, in the Siberian government of Tobolsk. They are half savages, and, though nominally Christians, adhere to Shamanism. Their language is a primitive Finnic dialect mingled with Tartar, and resembles closely that of their neighbors the Voguls, who inhabit the eastern slope of the Ural, number about 2,000, and are similar to the Calmucks. They live in villages of four or five yurts (tents of felt), dress in caftans, and are peaceable, jovial, lazy, and poor. Their principal occupations are hunting and fishing. The Bashkirs are also now considered to belong to the Finnic race. (See BASHKIRS.) The Finnic tribe of Meshtcheriaks has adopted a Turkish dialect and the Mohammedan faith. For the most important division of the Ugrie branch, and of the whole race, the Magyars, see HUNGARY.—The following are valuable recent works of reference on the subject: Schnitzler, *L'Empire des tsars au point actuel de la science* (Paris, 1862); Cuno, *Forschungen im Gebiete der alten Völkerkunde* (Berlin, 1871 *et seq.*); Koskinen, *Finnische Geschichte von den frühesten Zeiten bis auf die Gegenwart* (Leipsic, 1873); also the periodical *Archiv für wissenschaftliche Kunde von Russland*, published in Berlin.

FINSTERAARHORN, the loftiest peak of the Bernese Alps, 14,106 (or according to another measurement 14,026) ft. high, situated W. of the Grimsel, and visible from the new carriage road completed since 1867 over the Furca pass. The summit is accessible from the Faulberg hut, 5 m. from Lake Merjelen. Although the mountain is surrounded by stupendous glaciers, the highest point is said to be free from snow and ice, owing to its needle-like formation, whence it is called the *Nadel*; it is about 20

ft. long. The S. part of the mountain is called also Schwarzhorn, on account of the dark appearance of the rocks. Various attempts to scale the summit have been made during the last 60 years, with varied success; those made most recently have been most successful.

IORELLI, Giuseppe, an Italian archæologist, born in the province of Naples about 1823. He early became one of the directors of the excavations at Pompeii, but being denounced as a liberal, he was removed and subjected to privations and persecutions, despite the protection of the count of Syracuse, brother of the king of Naples, and not restored until the occupation of the kingdom by Victor Emanuel in 1860. He has since been the chief superintendent at Pompeii, and has made considerable progress in the restoration of the excavated buildings, and in the prosecution of new excavations, an annual allowance of 60,000 francs being granted by the government for that purpose. He has published one of the best maps of the uncovered portions of the city, and a chronological history of the discoveries (1860 *et seq.*), and edits the *Giornale dei scavi*, a journal containing a daily record of the excavations, from their beginning.

IORENTINO, Pier-Angelo, an Italian author, born in Naples in 1806, died in Paris, May 31, 1864. He early published novels, poems, and dramas, including *La Fornarina* and *Il medico di Parma*. Alexandre Dumas père, while at Naples, induced him to settle in Paris, and to aid him in the preparation of works relating to Italian life, some of which, especially *Jeanne de Naples*, were regarded as the exclusive production of Fiorentino. He wrote French with the same facility and elegance as Italian. He went to Paris with 150 francs, and left 600,000 francs, acquired by literary labors.

FIR, the popular name of several species of trees of the genus *abies*. Some botanical authors class the trees known as firs, spruces, and hemlock spruces in the one genus *abies*, while some others make three genera: *abies* for the spruces, *picea* for the firs, and *tsuga* for the hemlock spruces. In a botanical view, however, it seems better to group them all under *abies*, and consider the *picea* and *tsuga* as subgenera of *abies* proper. The firs are more closely related to the pines than are any other of the large family of *conifera*. While in the genus *pinus* the leaves are in clusters of two to five enclosed in a sheath, in *abies* they are scattered on the branches, and sometimes two-rowed. In *abies* proper, the spruces, the short, needle-shaped leaves are scattered around the branches and the cones nodding or pendent, with the scales persistent; in the section *tsuga*, the hemlocks or hemlock spruces, the flattened and petioled leaves are arranged as if in two rows; and in the section *picea*, the firs, the leaves are somewhat in two rows, the cones at maturity are erect, and the scales fall away from the supporting axis. In the present article we confine ourselves to the last named division.—

The firs are especially inhabitants of the colder parts of the world, though some are found in Asia and Mexico. The N. W. coast of North America is especially rich in firs, some of which assume majestic proportions in their native localities, and on account of their symmetrical forms are highly prized in cultivation. The timber of the fir for the most part does not rank among the most valuable kinds, though that of some species is remarkable for its durability; but the several resinous products they furnish have considerable commercial and economical importance. The best known native species is the balsam or balm of Gilead fir, *abies balsamea*, which is found from Pennsylvania northward, and is especially abundant in the British provinces. It grows 40 to 50 ft. high, and furnishes a wood of but little value; its striking characteristic is the liquid turpentine or "balsam" which it furnishes. This is found in vesicles or blisters in the bark,

of form, and was formerly used for ornament; but it so deteriorates with age, becoming shabby by the death of the lower limbs, that it should be avoided by the planter. Closely re-

Balsam Fir (*Abies balsamea*).

which remains smooth even on old trees. This exudation is known as Canada balsam or balsam of fir; but as the term balsam is now restricted to those oleo-resinous products which contain either benzoic or cinnamic acid, the proper name for the exudation from this fir is Canada turpentine. It is a clear, transparent fluid, of a honey-like consistence and a strongly terebinthinate taste. It consists of resin in solution in turpentine, and when exposed to the air loses the volatile turpentine and becomes brittle. It is collected by puncturing the blisters and receiving the liquid in a bottle or other receptacle; and as each vesicle yields but a teaspoonful or two, the process is a slow one. Formerly it was considerably employed in medicine, but as it possesses only the stimulant and diuretic properties of other forms of turpentine, its present chief use is in mounting microscopic objects and in serving as a varnish for maps, for which purpose it is diluted with spirits of turpentine. When young, the balsam fir is remarkable for its beauty of color and symmetry

Noble Silver Fir (*Abies nobilis*).

lated to this species, and at one time confounded with it, is Fraser's balsam fir (*A. Fraseri*), which extends much further southward; it has smaller cones and differently shaped bracts, but is similar in other respects.—On the Pacific coast is found one of the finest of the firs, and indeed one of the grandest of coniferous trees, *A. nobilis*, the noble silver fir; upon the mountains of the coast, at an altitude of 8,000 ft., it attains the height of over 200 ft.; it has a cinnamon-colored bark and very large cones, which are noticeable for the conspicuous points of the bracts. This fine species is highly

Great Silver Fir (*Abies grandis*).

prized in England as an ornamental tree, but it has not been sufficiently tested in the Atlantic states to prove whether it is perfectly hardy or not. *A. grandis*, the great silver fir, is

another species of the Pacific coast, and is found more abundantly northward; it attains even a larger size than the last named, and in its native localities is converted into lumber for exportation to the Hawaiian islands and elsewhere. This has been found hardy by the eastern cultivators. The lovely silver fir, *A. amabilis*, is another large tree of northern California and Oregon.—Among species of fir of the eastern hemisphere, the most common is *A. pectinata*, the common silver fir, which has been planted in this country to some extent; but it has one of the faults of our balsam fir, being short-lived. It is a native of the mountains of central Europe and of those of Asia, and attains the height of a first-class tree; its wood is of great value, being used in carpentry and boat building, for masts, and even for carved work; its bark is used for tanning and

it is equal in grain and color to Bermuda cedar. It is valued in England as an ornamental tree. Other species, the value of which in this country has not yet been sufficiently determined, are *A. Apollinis*, from Greece; *A. bracteata*, from Oregon; *A. Cilicica*, from Asia Minor; *A. Pinsapo*, a native of the mountains of Spain; *A. Vietchii*, from Japan; and *A. religiosa*, the sacred silver fir of Mexico.—Very full accounts of the history and uses of the species of fir may be found in the fourth volume of Loudon's "Arboretum et Fruticetum," and brief descriptions, with the nomenclature corrected according to the views of modern botanists, in Hoopes's "Book of Evergreens" (12mo, New York, 1868). (See **Hemlock Spruce**, **Larch**, and **Spruce**.)

FIRDUSI, *Ferdusi*, or *Ferdousi*, **Abul Kasim Mansur**, a Persian poet, born near Thus, in Khorasan, about A. D. 940, died in Thus in 1020. He was often called Thusi from that city, and his ordinary name (*firdus* meaning both garden and paradise) was given him either because his father was a gardener or from the excellence of his poems. He continued to reside for many years in his native village, and occupied himself with the traditions concerning the ancient kings of Persia. He was advanced in age when he repaired to the court of Mahmud of Ghuzni, where he was presented to the most distinguished scholars and poets of the time, and encouraged by the sultan to compose his great historical poem, *Shah Nameh*. He spent 80 years upon this work, which contains 80,000 verses, and relates the mythical and romantic exploits of the Persian kings from the foundation of the world, that is, from the hero Kaimura, who disputed the earth with genii, to the invasion of the Mussulmans about A. D. 636. Its most interesting portion is the account of the prowess of the hero Rustem. Receiving 80,000 silver, instead of the same number of gold dirhems promised to him by the sultan, he is said to have distributed the whole sum, in three equal parts, to the slave who brought it and two attendants of the bath where he received it. He was sentenced to death for having treated the sultan's gift with so much indignity, and with difficulty procured a revocation of the sentence. He then fled from the court, leaving behind him a bitter satire on the sultan, and took refuge first at Mazanderan and afterward at Bagdad. Being finally permitted to return to his native town, he spent there, according to some narratives, the remainder of his life; but according to others he died before receiving the pardon of the sultan, which was accompanied by munificent gifts. The *Shah Nameh* is one of the oldest poetic monuments of Persian literature, and is regarded by the orientals as an authority in regard to the primitive history of western Asia, and especially by the disciples of Zoroaster, since it contains his praises, and its mythology is that of the religion he taught. It is really, however, of little value as a historical authority. Its true merit con-

Silver Fir (*Abies pectinata*).

its leaves for litter; it yields the Strasburg turpentine, an exudation resembling the Canada balsam, collected in a similar manner, and used in Europe for similar purposes. The Cephalonian fir (*A. Cephalonica*), a native of the mountains of Greece, is a fine tree 60 ft. high, and is a striking object on account of its dark green leaves, which are rigid and stand out from the stem at right angles, pointing in every direction, and giving the tree the appearance of being on the defensive. The timber of this tree is hard and very durable, that in houses 300 years old being perfectly sound. It has proved fairly hardy in this country. Nordmann's fir (*A. Nordmanniana*) is another fine species, the beautiful green color of which commends it to the attention of cultivators. *Picea Webbiana*, Webb's purple-coned silver fir, comes from the Himalayas, where it was discovered by a travelling naturalist, Capt. W. S. Webb. In its native locality its wood is highly prized;

sists in the purity of its language and in the great poetical beauty of its episodes. An edition of the whole in the original Persian was published by Turner Macan (4 vols., Calcutta, 1829). An abridged English translation of it in prose and verse by J. Atkinson, with a biographical notice prefixed, was published in London in 1832. The best German (abridged) edition is by Görres (Berlin, 1820), and translations of extracts appeared in Berlin in 1851 and 1853. There is an edition in Persian and French, by J. von Mohl (4 vols., Paris, 1838-'54).

FIRE. See FLAME, HEAT, and LIGHT.

FIRE BEETLE. See FIREFLY.

FIRE ENGINE, a machine for throwing a stream of water for the purpose of extinguishing fires. The earliest notices of machines used for this purpose are in some allusions of ancient Roman writers to an apparatus, nowhere described, which they called a *sipho*, and which some now regard rather as the name of the aqueduct pipes for supplying water to houses than as an especial fire-extinguishing machine. That they were very inefficient may be inferred from the remark of Seneca, that owing to the height of the houses in Rome it was impossible to save them when they took fire. Apollodorus the architect, perhaps, was the first to suggest the use of a kind of hose, in recommending for the conveyance of water to high places exposed to fiery darts the use of the gut of an ox having a bag filled with water affixed to it; by compressing the bag the water was made to rise in the tube. In early periods of English and French history the chief protection against destructive fires appears to have consisted in the care with which those used for domestic purposes were managed. The curfew bell, or *couvre feu*, was sounded at 8 o'clock as a signal for the fires to be extinguished. In Germany fires were of frequent occurrence in the latter part of the 15th century and in the 16th; and ordinances were established regulating the manner of building houses and the methods to be adopted in preventing fires. At Augsburg fire engines, called "instruments for fires" and "water syringes useful at fires," were in use in 1518. The Jesuit Kaspar Schott describes one he saw at Nuremberg in 1657, which much resembled those in use at the present time; and he mentions that 40 years before he had seen a similar engine of smaller size in his native city, Königshofen. The one at Nuremberg was placed upon a sledge 10 ft. long and 4 ft. broad, which was drawn by two horses. It had a water cistern 8 ft. long, 4 ft. high, and 2 ft. wide. It was moved by 28 men, and forced a stream of water an inch in diameter to the height of 80 ft. The cylinders are described as lying in a horizontal position in a box. No mention is made of an air chamber, nor of anything more than a short flexible discharge pipe, which could be directed to one or the other side. The oldest record of fire engines in Paris is in the work of Perrault, published in 1634. From this it appears that there

was one in the king's library, which, though having but one cylinder, threw out the water in a continuous jet to a great height; a result attained by the use of an air chamber, of which, as introduced into the fire engine, this is the earliest notice. Destructive fires were of frequent occurrence in Paris and in the provinces in the latter part of the 17th century, the work of incendiaries, who were known as *boute-feux*. In 1699 a special officer was charged with the duty of constructing, keeping in repair, and using at fires the 17 *pompes portatives* belonging to the royal service, and in 1722 the number of these had increased to 30. There were besides many others not included in this particular service. It is believed that none were provided with air chambers; for in 1725 a paper was published in the *Mémoires* of the academy of sciences at Paris describing this improvement as adopted in the engines at Strasburg, and in it no intimation is expressed of the same contrivance ever having been introduced in Paris. Leathern hose was invented about the year 1670 in Amsterdam by two Dutchmen named Van der Heyde, and the apparatus was speedily introduced into all the engines of the city. They also invented the suction pipe. In 1690 the inventors published a folio volume containing engravings, the first seven representing dangerous conflagrations at which the old engines had been used to little purpose; the twelve following represent fires which had been extinguished by the new engines, and the method of working the machines. The details of their construction are not given. The title of the work, which is regarded as exceedingly valuable on account of its excellent engravings, is *Beachrijving der nieuwlijks uitgevonden slang-brand-spuiten*.—It was long before the inventions of the Dutch were introduced into England. At the close of the 16th century the only engines there known were "hand squirts," or syringes, made of brass, and holding two or three quarts of water. Some of them are still preserved in the vestry room of St. Dionis Backchurch in Fenchurch street, London. Each one required the labor of three men, one on each side to hold the instrument steady with one hand, and with the other to direct the nozzle, while the third man worked the plunger. When discharged, the piston was taken out and the nozzle was dipped into water, which flowed in and filled the body. They were afterward fitted into a portable cistern, and furnished with levers for working the pistons. About the close of the 17th century Newsham's improved engine was patented in England. This was a strong cistern of oak, placed upon wheels, furnished with pumps, air chambers, and a suction pipe of strong leather, to prevent its collapsing when the air began to be exhausted from it by the action of the pumps, through which was run a spiral piece of metal. The end for receiving the water was provided with a strainer. In case the suction pipe could not be conve-

niently used, the water was supplied to the cistern by buckets passed by hand.—Modern engines consist essentially of two vertical double-acting force pumps (see PUMP), one under each end of a lever beam (or sometimes four single-acting pumps), to which are attached long brakes for many men to take hold of and work by hand. The pumps discharge into one reservoir, the upper part of which contains air, that acts as a spring to cause the water alternately introduced by each pump to flow in a uniform current through the discharge pipe. This pipe opens in the reservoir below the surface of the water, and leads without to any required distance, according to the number of lengths of leathern hose that may be attached together by the brass couplings with which they are furnished. The water is discharged through a tapering metallic pipe, upon the end of which

is screwed a tip of any required bore, which is held in the hand to direct the stream upon the fire. A suction pipe from the lower end of the force pump is always ready to be used when necessary; but where a stream of water with sufficient head, as from the aqueduct hydrants, can be introduced, the suction pipe is not required. The machine is attached to a carriage constructed expressly for the purpose, and furnished with various implements such as are likely to be wanted in conflagrations. The brakes are long wooden arms extending over the wheels each way beyond the extremities of the engine, or sometimes transversely to the carriage, and attached at right angles to the lever beams, which are arranged along the horizontal axis placed over the centre of the carriage. They are moved up and down by men standing on the ground each side of the engine, working with

Self-propelling Steam Fire Engine.

others who take their position on the top.—The great modern improvement in fire engines is the application of steam power to work them. This was first attempted by Mr. Brathwaite, in London, in 1830. His first engine was of barely six-horse power, weighing a little over 5,000 lbs., was furnished with an upright boiler, in which steam was generated to a moderate working pressure in 20 minutes, and was capable of forcing about 150 gallons of water per minute from 80 to 90 ft. in height. It had a steam pump of the same form as those now in common use, the steam and water pistons being on opposite ends of the same piston rod, the former being 7 in. in diameter and the latter 6½ in., and the stroke of each 16 in. A larger engine of the same general construc-

tion was built by Brathwaite in 1832 for the king of Prussia; but though its performances were highly spoken of, this attempt to apply the power of steam for fire-engine purposes cannot be said to have been successful. The time required for raising steam, and the great weight of the apparatus when adequate boiler power was obtained, were undoubtedly the principal difficulties. In New York, after the great fire of 1835, premiums were offered for plans of steam fire engines, and in the year 1841 an engine was built, from plans by Mr. Hodges, under a contract with the associated insurance companies, and was on several occasions brought into service at fires with good effect; but though very powerful, its great weight proved to be a fatal objection, and it

was at last sold and converted to other uses. To the city of Cincinnati belongs the credit of giving the first practical demonstration of the feasibility of this application of steam, and of making steam fire engines the basis of a fire department of unequalled efficiency. They are usually drawn by horses, one or two pair being used; but in a few instances steam has been successfully employed to propel them. Such a one, made by the Amoskeag manufacturing company, was brought into use at the engine house No. 20 in New York city in 1873. A view of it is given in the preceding engraving, in which *b* represents the boiler; *a*, the air chamber for compressed air; *cc*, steam cylinders for working the pumps, *p p*, through eccentrics not shown, moving at the same time the small balance wheel, over the pulley of which is seen a stout chain which passes over a drum on the axle of the drive wheel, *h*. The suction hose is attached at *d*, and the discharge hose at *f*, which is connected with the air chamber. The apparatus for steering is controlled by the capstan, *g*, placed in front of the driver's seat. This engine weighs about four tons, and is capable of propelling itself at the speed of a rapid trot. It has a capacity for throwing water through a 1½-in. nozzle to a height of 140 ft. and to a horizontal distance of about 250 ft. Through a 1½-in. nozzle it will throw a stream about 220 ft. vertically and 300 ft. horizontally. The usual working pressure of steam is from 60 to 80 lbs. per square inch, the steam escaping by a safety valve when above the latter pressure. When standing at the engine house the boiler is kept supplied with water and steam from a heater in the basement, at a pressure of about 70 lbs. per square inch. The fireplace is kept charged with kindling wood and other combustibles, which are capable of supplying sufficient heat in one minute after ignition, during which time the water and steam supplied from the heater are capable of giving propelling force.

FIRE EXTINGUISHER. Many attempts have been made to produce apparatus to extinguish fires by excluding atmospheric oxygen from the flame. Among the earliest machines of this kind was that known as Phillips's fire annihilator, which was made of several sheet-iron cylinders placed one within another. Water was contained between the two outer ones, which when heated generated steam and discharged it into an inner cylinder. Within the latter was the gas-generating mixture, a compound of charcoal, nitre, and gypsum. An apparatus for igniting it consisted of a bottle of chlorate of potash and sugar, upon which could be emptied another of sulphuric acid. A mixture of gases and steam was expelled from the top of the machine.—An apparatus for extinguishing fires was invented by MM. Carlier and Vignon of Paris, and patented by them in 1862, for which a patent was issued in the United States in 1869 and reissued in 1872. The principal advantage possessed by this ma-

chine consists in charging water with carbonic acid gas and projecting it into the fire by the force of its own pressure. Such a machine, made by the Babcock manufacturing company of New York and Chicago, who own the American patent, is represented in figs. 1 and 2. A

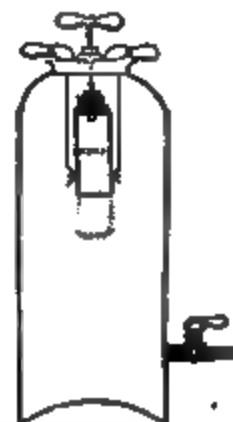


FIG. 1.

FIG. 2.

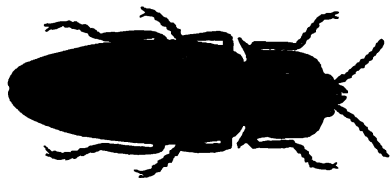
metallic cylinder, of sufficient strength to bear an internal pressure of over 250 lbs. per square inch, contains in its upper part a glass or leaden vessel capable of holding 8 or 10 oz. of sulphuric acid. It is suspended by two pivots placed upon opposite sides and below the centre of gravity, but retained in an upright position by means of the stopper, which is held in the mouth of the vessel by a rod which passes through the hermetically adjusted cover. About 7 gallons of water holding in solution 2½ lbs. of bicarbonate of soda is placed in the large cylinder, and about 8 oz. of commercial acid is put in the glass or leaden vessel, and held in position by the stopper and the rod which passes through the cover. The latter is then clamped to its place, and if the stopper be removed the vessel will become inverted by its own weight and the acid precipitated into the solution of carbonate of soda. This causes the liberation of a quantity of carbonic acid gas, which at the ordinary pressure would occupy nearly eight cubic feet, but which under the pressure produced by its own elasticity, in this case about 100 lbs. per square inch, remains

FIG. 3.

dissolved by the water. If a hose be attached to the stopcock placed in the lower part of the cylinder, a stream of water holding carbonic acid gas in solution is forced out with great rapidity, carrying with it bubbles of gas which

are suddenly liberated by the diminution of pressure. It has been found that when this stream is projected upon a fire it possesses extraordinary extinguishing powers. A pair of large extinguishers may be mounted upon a carriage drawn by horses. This, known as the Babcock self-acting fire engine, is shown in fig. 3. These cylinders are capable of holding about 75 gallons each, and of sustaining an internal pressure of 400 lbs. per square inch. Many are in use in the United States, and are found to render efficient service in extinguishing fires before they have spread to much extent, and even then they may be used with advantage as aids to the steam engine, or alone.

FIREFLY, the popular name of many serri-corn beetles, belonging to the families *elateridae* and *lampyridae*, and to the old genera *elater* and *lampyris* of Linnæus; the luminous species of the former belong to the new world, those of the latter to both hemispheres; these insects are also called fire beetles. The elaters have a firm and solid body, of an oval form; the middle portion of the sternum between the first pair of legs is prolonged into a short spine usually concealed in a cavity behind it; the antennæ in the males are simply serrated. They are called spring beetles from the faculty possessed by them of throwing themselves upward with a spring by means of the spine; as they live on plants, when they drop to the ground they often fall upon the back, whose great convexity and the shortness of the legs prevent them from turning over; the spine having been unsheathed by bending the head and thorax backward, it is made to strike with such force against the sheath by the sudden straightening of the body, that it projects the insect into the air, and gives it the chance of coming down on the feet; if unsuccessful, other attempts are made until the object is attained. Fireflies of this tribe are numerous in tropical America, including the West Indies. One of the largest and most brilliant is the night-shining elater, or lightning spring beetle, the *cucujo* of the West Indies (*pyrophorus noctilucus*, Linn.); this is more than an inch long, of a dark color, and gives a strong light from two oval tubercles on the dorsal surface of the



Cucujo (*Pyrophorus noctilucus*).

thorax, and from the under surface of the segments of the body. Specimens are frequently brought alive to the United States, where they may be kept for some time if fed on sugar cane; the grub is said to be very injurious to the sugar cane by devouring the roots; one of these

was once transported to Paris, and escaping into the streets, after assuming its perfect state, very much astonished the inhabitants of that city. This insect is common in summer, both in the lowlands and at moderate elevations; according to Mr. Gosse, the thoracic light is visible even in broad daylight; when undisturbed, these spots are dull white, but they gradually become bright when touched, the brilliancy beginning at the centre and extending until the whole tubercle shines with a rich yellowish green. The light is so intense that it will cast a shadow of any object on the opposite wall in a dark room; the under side of the thorax seems as if it were red-hot, particularly beneath the tubercles; when left to itself, the insect becomes quiet, and the light fades to a mere speck. The insect when held in the hand shows only a green light, but when flying free it diffuses a rich ruddy glow from the ventral surface; it may show the green light at any time, but the red light only when flying; the former is seldom shown during flight, but in rare instances both tints are seen, producing an exceedingly beautiful effect. The thoracic light is subject to the will of the insect, but the abdominal is by some considered involuntary; the former is intermittent, but the latter seems to be a constant red glare, which will illuminate the ground for the space of a yard square. There are more than a dozen other luminous elaters mentioned by Illiger, found in South America, where they fly during dusk and at night, generally remaining quiet during the day. These insects are used by the natives, confined under gauze, as ornaments for their head dresses and garments; they have been usefully employed by the Indians for the purposes of illumination in their dwellings and in their journeys; several, confined in a glass vessel, give light enough to read small print by. This is one of many instances in which an acquaintance with natural history has dissipated the fears of the superstitious; the deceitful light of supposed malignant spirits has become the beautiful radiation of an insect sporting amid its inoffensive companions. These insects may be kept for weeks, if fed on sugar cane, and placed in damp moss; their light is more powerful than that of the glowworm. The larvæ of many elaters are also more or less luminous. In the adults both sexes are luminous. (See "American Naturalist," vol. ii., 1869, pp. 420-423.)—The genus *lampyris* (Fab.) includes the fireflies of the United States and the glowworm of Europe; they are characterized by soft and flexible bodies, straight and depressed; there is no snout, and the head in the males is occupied almost entirely by the eyes, and is much concealed by the thorax; the antennæ are short, with cylindrical and compressed articulations; the abdomen is serrated on the sides; the elytra are coriaceous, and the legs simple; the females have only rudiments of elytra at the base of the abdomen. The glowworms of Europe, *L. noc-*

tiluca, *L. Italica*, *L. splendidula*, and *L. hemiptera*, will be described under GLOWWORM. In the United States there are many species, of which the *L. scintillans* (Say) and *L. corusca* (Linn.) are familiar examples. The latter is 4½ lines long; the body is oblong pubescent, brownish black; a rose-colored arched streak, dilated and yellow anteriorly, joins the elevated thoracic disk; the elytra are obsoletely carinated, with numerous minute dots; it is found as far north as 54°. Both sexes are luminous, but the light is strongest in the female; the light streams from the ventral surface of the abdomen; even the larvæ of many species, and also the eggs, are luminous. Like the elaters, they conceal themselves by day, and fly about in warm damp evenings; the males fly from plant to plant, while the female remains still, betraying herself to the other sex by her brighter light, of a bluish or greenish white tint. The luminous *lampyridæ* of tropical America are very numerous and brilliant, in the words of Humboldt, repeating on the earth the spectacle of the starry heavens. According to Gosse, their sparks, of various degrees of intensity, in proportion to the size of the species, are to be seen gleaming by scores about the margins of woods and in open places in the island of Jamaica. This writer describes many species, the most remarkable of which are *pygolampis xanthophotis* and *photuris versicolor*. *P. xanthophotis* is three fourths of an inch long and one third of an inch wide; the elytra are smoke-black; the thorax drab, dark brown in the centre; the abdomen pale, with the last three or four segments cream-white; the light is very intense, of a rich orange color when seen abroad, but yellow when examined by the light of a candle, and intermittent, lighting up a few segments or the whole hinder part of the abdomen. *P. versicolor* is a large species, with drab-colored elytra, less brilliant in its light and less rapid in its flight than the former species; the light is of a bright green hue; it frequently rests on a twig, gradually increasing the intensity of its light to the brightest, and then by degrees extinguishing it, remaining dark a minute or two, shining and fading again like a revolving light. Sometimes one species is attracted by the other, when the intermingling of the green and orange rays presents a very beautiful appearance. Other smaller species, which fly in at the windows in summer in considerable numbers, have either a yellow or a green light. The little firefly seen in warm summer nights is a species of *photuris*; it is the male only that flies; the wingless female, seldom seen, a glowworm, emits a much brighter light; the larva, which resembles the female, is luminous, and, it is said, the eggs are also. Another native species is *photinus pyralis*, the larva of which feeds on soft-bodied insects and worms.—Two species of hemipterous insects, of the genus *fulgora*, are said by some authors to be luminous, though the greatest weight of negative evidence is against this statement; the snout in this genus is long,

straight or curved upward, and the light is said to emanate from its extremity, whence their common name of lantern flies. The South American species (*P. laternaria*, Linn.) is a large and handsome insect, with wings varied with black and yellow; Mme. Merian asserts positively that the light from the head is so brilliant that it is easy to read by it; Count Hoffmannsegg, M. Richard, and the prince of Neuwied have denied the truth of this statement; but, from the positive assertion of the above lady, the general application of the name firefly to this species, and the possibility that the emanation of light may be perceptible only at certain seasons of the year, it may well be that the insect possesses luminous power. It flies high, and hovers about the summits of trees. Another species (*F. candelaria*, Fab.), from China, of a greenish color varied with orange and black, with its long snout curved upward, is said to flit among the branches of the banian and tamarind trees, illuminating their dark recesses.—The causes which produce this light have been the subject of much discussion among naturalists; some lay the principal stress upon the influence of the nervous system, others upon the respiration, others upon the circulation; chemists have asserted the presence of phosphorus in the fatty tissue whence the light seems to issue, but there is no proof of this from analysis. The most recent writers agree that the luminous tissue is made up of fat globules permeated by numerous tracheæ conveying air, with no traces of nerves or blood vessels, according to Dr. Burnett. It does not appear satisfactorily determined whether there may not be in this tissue phosphorized fats which give forth light on contact with oxygen, hydrogen, or nitrogen. Matteucci concludes from his experiments that the light is produced by the union of carbon of the fat with the oxygen in the tracheæ, by a slow combustion, and without any increase of temperature. The intermittence of the light is believed to depend on the movements of respiration, and to be entirely independent of those of the circulation, though Carus says that the light of the glowworm grows brighter with each fresh wave of blood sent to the neighborhood of the tissue. It is probable also that the nervous system has some influence on the light, though it may not be essential to its production; as in the electric fishes we find the physical and chemical elements necessary for the production of electricity, to a great extent independent of, yet brought into harmonious action and directed by, the nervous system, so in the luminous insects we may have the chemical elements necessary for slow combustion and the production of light independent of this system, yet influenced and directed by it; the light may also be directly influenced by the action of the nerves on the respiratory function. The luminous substance grows brighter in oxygen, duller in carbonic acid, and shines even in the dead insect and

under water. It is said that there is no heat accompanying this light, though it be a true combustion and a combination of carbon with oxygen; this may be owing to the rudeness or imperfection of our instruments, or to the slowness or peculiarity of the combustion.

FIRE-PROOFING, a term applied to processes by which fabrics or buildings are rendered proof against taking fire. Cloths saturated with mineral paint are rendered less liable to inflame from falling cinders or sparks, but cannot be made to withstand continued heat. Several methods have been devised for rendering wood fire-proof. In the United States wooden roofs are partially secured from fire by covering them with a coating of gravel, secured by mixture with coal tar or asphaltum; but of course this affords protection only against sparks or cinders. The English war department several years ago made experiments to test the utility of an application of one of the cheap soluble alkaline silicates, as the silicate of soda. Painting the wood with a strong solution of the salt was very useful. But the best results were obtained by going over the coating of the silicate of soda with another of lime whitewash, and after this had stood a few hours coating it with another stronger solution of the soda. The first solution, it is directed, should be prepared by mixing with one measure of the thick sirup of silicate of soda three measures of water; the wood should be brushed over with this, as much being laid on as the wood can be made to absorb. When nearly dry, the lime wash of creamy consistence is applied, and after this has become moderately dry, the solution prepared with two parts of sirup to three of water is laid on with the brush. The covering thus prepared adhered very well, even when exposed to a stream of water and to rains; the former when striking the wood in the shape of a jet only slightly abraded it, and it was not easily removed by applying heavy blows to the wood. It was found that when the silicate was prepared so as to mix readily with water, one pound was sufficient to cover 10 square feet, and at the rate of £20 per ton of the sirup, the cost of the silicate for this amount of surface is only about twopence. By this application to the timbers and other woodwork of houses, they may be rendered comparatively safe from fire; but for important structures, the most thorough protection is in the use of wrought-iron beams, built into the walls of brick or stone, and of iron or other incombustible material for the partition walls, floors, roof, and stairs. The most efficient methods in use in the United States are described in the article **BEAM**. Even buildings thus constructed in the most perfect manner may be completely ruined if filled with combustible goods that become once thoroughly ignited; for the beams when heated must expand, and with a force against the walls that cannot be resisted. Cast-iron beams and columns have been shown to be more objectionable even than wood; for on be-

coming heated they rapidly lose their strength, and are liable to give way suddenly, and much sooner than timbers even when consuming.

FIREWORKS. See **PYROTECHNY**.

FIRKIN (Dan. *fire*, four), the fourth part of a barrel, an old English measure of capacity, variously given as containing from $7\frac{1}{2}$ imperial gallons to 10·987 standard gallons. For ale its capacity was one gallon less than for beer; as usually reckoned, it was 8 gallons for the former and 9 for the latter. In the United States, firkin designates a tub, usually of butter, the weight of which should be 56 lbs. In some parts of Pennsylvania it is 110 lbs.

FIRMAMENT (Lat. *firmamentum*, support), in ancient astronomy, the eighth sphere or heaven which surrounded the seven spheres of the planets and supported the fixed stars. Two motions were attributed to it: the diurnal motion from east to west, and a motion from west to east, which was completed, according to Ptolemy, in 36,000 years, when the fixed stars were again in precisely the same position as at the beginning. This period was called the Platonic or great year. In common language, firmament signifies the sky or heaven.

FIRMAN, or **Ferman**, a Persian word signifying an order, employed especially in Turkey to designate any decree issued by the Porte, and authenticated by the sultan's own cipher or monogram, called the *tua*. Each of the ministers and members of the divan has the right of signing firmans relative to the business of his own department, but only the grand vizier is authorized to place at their head the *tua*, which alone gives them force. A decree signed by the sultan's own hand is called *hatti-sherif*. The name firman is also applied to a Turkish passport, whether issued by the Porte or by a pasha, enjoining the subordinate authorities to grant the traveller bearing it protection and assistance. In India, a written permission to trade is called a firman.

FISC (Lat. *fiscus*), originally, a wicker basket in which money was carried about and kept. Under the Roman republic the state treasury was called *ærarium*. When the empire was established the name *fiscus* was given to the treasure which belonged to the emperor as such. The public treasure, properly speaking, the title to which was vested in the senate as the representative of the old republic, continued to be called *ærarium*, and the private property of the emperor as an individual was termed *res privata principis*. Under the later emperors no such separate fund as the *ærarium* was any longer in existence, and the distinction between *ærarium* and *fiscus* was lost. The imperial treasury, having become the only treasury of the state, was designated by both terms. Some of the rights of a natural person were accorded to the *fiscus*, and hence by a fiction of law it was deemed a person, in the same manner as a corporation or the community of a city or village. In the civil law of modern Europe the *fisc* is the property of the state.

Such property having often been obtained to a large extent from fines and the possessions of condemned persons, the word confiscation, derived from *fiscus*, signifies the forfeiture of any species of property to the state.

FISCH, George, a French Protestant divine, born in Switzerland, July 6, 1814. He was educated in the academy at Lausanne, and entering the ministry was for nearly five years pastor of a German-speaking congregation at Vevay. He then emigrated to France and joined the French Evangelical church. In 1846 he was called to Lyons as the successor of Adolphe Monod. In 1855 he removed to Paris to become pastor of the church "Taitbout," where he is the colleague of Edmond de Pressensé, who is his brother-in-law. Dr. Fisch advocates the independence of the church from the state. He is a director of the evangelical society of France, a powerful auxiliary to the union of evangelical churches, and since 1863 has held the presidency of the "Union."

FISCHART, Johann, called **MENTZER**, a German writer, born probably in Mentz about 1545, died probably at Forbach in or after 1589. He was educated as a jurist in Worms, visited England, spent some time in Frankfort and Strasburg, became an advocate in the imperial tribunal of Spire in 1582, and held a public office at Forbach from 1585 to 1589. He was one of the most voluminous German writers of his day, excelling in satire, burlesque, and allegory. Among his works, which were published under various pseudonyms, are *Das glückhafte Schiff von Zürich* (1576; new but defective edition, 1829), and *Psalmen und geistliche Lieder*, (Strasburg, 1576; new edition, Berlin, 1849). Wackernagel has published *Johann Fischart von Strasburg, und Basel's Anthel an ihm* (Basel, 1869).

FISCHER, Ernst Kuno Berthold, popularly known as **KUNO FISCHER**, a German philosopher, born at Sandewalde, Silesia, July 23, 1824. He graduated at Halle, and taught philosophy at Heidelberg from 1850 to 1853, when he was suspended by the government of Baden, the reason not being assigned. He continued to reside at Heidelberg till 1855, when he went to Berlin, where permission to resume his profession was at first denied to him, but eventually granted in September, 1856, by the king at the instance of the university authorities. He had however already accepted a professorship at Jena, where he has since continued to be one of the most eloquent exponents of modern philosophy. His principal works are *Die Logik und Metaphysik, oder Wissenschaftslehre* (1852), and *Geschichte der neuern Philosophie* (1854 et seq.), with masterly delineations of the systems of Descartes, Spinoza, Leibnitz, and Kant. Fischer assumes for the period of transition a parallelism in reverse order with the line of development of ancient philosophy, and states in the latter and most important of his works that "the modern mind seeks to find a way out of the theological conception of the

world, with which it is filled, to the problems of cosmology." He has also written on Bacon, Schiller, and Shakespeare, *Geschichte der auswärtigen Politik und Diplomatie im Reformations-Zeitalter 1485-1556* (Gotha, 1874), &c.

FISCHER, Gotthelf, a Russian naturalist, born at Waldheim, Saxony, in 1771, died in Moscow, Oct. 18, 1853. After graduating as a physician at Leipsic and holding a professorship at Mentz, he settled at Moscow in 1806, lectured at the university and medical academy, founded a museum of natural history, and published upward of 180 works, including *Oryctognosie* (2 vols., Moscow, 1818-'20), *Oryctographie du gouvernement de Moscou* (fol., 1812, with 65 engravings, and translated into Russian), and *Entomographie de la Russie* (3 vols., 1820-'28), translated into Latin, German, &c.

FISCHER VON ERLACH. I. Johann Bernhard, a German architect, born in Prague or Vienna in 1650, died in Vienna, April 5, 1723. He acquired in Rome the style of Bernini, which was admired in Vienna, where he became the architect of prominent public buildings, including the palace of Schönbrunn and the church of San Carlo Borromeo. **II. Joseph Emanuel**, son of the preceding, born about 1680, died about the middle of the 18th century. He was ennobled in 1735, and excelled in the same style of architecture as his father. In 1727 he constructed the first steam engine in Vienna.

FISH, Hamilton, an American statesman, born in New York city, Aug. 3, 1808. His father, Col. Nicholas Fish, was a distinguished officer of the revolutionary army. He graduated at Columbia college in 1827, and was admitted to the bar in 1830. In politics he was a whig, and was repeatedly nominated by that party as a candidate for the state assembly, but was defeated by the democratic majority. In 1842 he was elected a representative in congress from the sixth district of New York. In 1846 he was a candidate for lieutenant governor. The whig candidate for governor, John Young, was elected, but Mr. Fish, who had incurred the hostility of the anti-renters by his warm denunciation of their principles, was defeated. But his successful competitor, Addison Gardiner, a democrat who had received the support of the anti-renters, resigned the office in 1847 on becoming a judge of the court of appeals, and Mr. Fish was elected in his place. In 1848 he was chosen governor by about 80,000 majority, and in 1851 he was chosen United States senator in place of Daniel S. Dickinson. In the senate he opposed the repeal of the Missouri compromise, and acted with the republican party from its formation to the end of his term in 1857. In that year he went to Europe with his family, and remained till shortly before the commencement of the civil war. During that contest he contributed in money to the support of the government. In January, 1862, in conjunction with Bishop Ames, he was appointed by Secretary Stanton a commissioner to visit

the United States soldiers imprisoned at Richmond and elsewhere, "to relieve their necessities and provide for their comfort." The confederate government declined to admit the commissioners within their lines, but intimated a readiness to negotiate for a general exchange of prisoners. The result was an agreement for an equal exchange, which was carried out substantially to the end of the war. In March, 1869, Mr. Fish was appointed by President Grant secretary of state, and was reappointed by him at the commencement of his second term in March, 1873. On Feb. 9, 1871, the president appointed him one of the commissioners on the part of the United States to negotiate the treaty of Washington, which was signed by him on May 8 of that year. In November, 1873, he negotiated with Admiral Polo, Spanish minister at Washington, the settlement of the Virginian question.

FISH CROW. See OWOW.

FISH CULTURE, or *Pisciculture*, the breeding and rearing of fish. The subject may be divided into two branches: 1, the rearing and fattening of fish in artificial ponds or lagoons; 2, the propagation of fish by the artificial impregnation of the spawn, which is the signification ordinarily attached to the term at the present time. The Chinese have been credited with being the first to practice fish culture, but their methods are such as are included in the first class only, and are confined to the practice of placing twigs in the water during the spawning season of the carp, and removing them when covered with spawn. These twigs, with their fertilized ova, have been sold in the markets, the purchaser placing them in ponds, or ditches, to hatch. This is as far as the Chinese seem to have advanced in this art, and it is a matter of doubt whether they were at all superior to the Romans in it. The latter, according to Oppian ("*Halienticks*," book i., v. 75 to 95), caught very young fish and placed them in ponds, where they were fed liberally and were taken out when full grown to grace the patrician tables, or were preserved in ponds to be angled for by the Roman nobles. The pictorial relics of ancient Egypt show that large vivaria were built and maintained for the purpose of growing fishes either for the table or for religious sacrifice to divinities whom they wished to propitiate. This custom of growing fishes for religious purposes is mentioned by Martial. *Ælian* tells of some which were kept in a stew and dedicated to Jupiter Militant. *Diodorus Siculus* records a reservoir near Girgenti, in Sicily, of several miles in circumference, which was fed with fresh water and stocked with fish; this was built for the tyrant Gelon. The ponds of the Romans, according to *Pliny* and *Columella*, were of the most expensive and complete construction. The former tells how *Hortensius* was more anxious about the welfare of his mullet than of his men, and that his fish-servants were so numerous that they were not to be counted. He had

sailors to procure food for them, and, when the weather did not permit them to go out, a troop of butchers and provision dealers sent in estimates for supplying his fish with provender. There was an overseer, or "nomenclator," who received a high salary and whose duty it was to give the fish their individual names and teach them to "wag their tails, fawn like dogs, and permit themselves to be scratched and clawed" when he exhibited them to visitors. These stews seem to have been kept more for ornament than profit, for *Varro* says: "My friend *Hortensius* would much sooner lend you the carriage-horses from his stable to go and buy mullet where you liked than send and procure you one out of his own ponds. It often happens in his house that, when fish are wanted, in place of levying them from his costly stews, he will send to *Puteoli* for supplies." It is recorded that when *Cæsar* wished to entertain his friends on fish he could only obtain from *C. Hirtius* 600 lampreys, on the express condition that they were a loan to be repaid on a certain day, not in specie, but in weight and kind. There is undoubtedly much fable concerning the affection of the ancient Romans for individual fishes, but the fact that they reared them is well established. In Italy the growing of the eel is carried on extensively in the lagoons of Venice, at *Comacchio*, and elsewhere, in connection generally with other species, such as mullet and plaice. This industry at *Comacchio* is as old as the 13th century. The precise date when the lagoon was formed into a fish-pond is not known, its earliest record being 1229. The lagoon at this place is situated between the *Reno* and *Volano* branches of the *Po*, and is divided into numerous sections, the principal entrances into which are from the two mouths. Its waters are diked out from the *Adriatic*, which, however, communicates with the lagoon through the *Grand Palotta* canal and its branches. Flood-gates control the various entrances and regulate the migration of the fish. The ascent of the young eels from the sea begins early in February, and continues until the end of April, when the flood-gates are closed. The harvest commences early in August, and continues till December. During the interval from their ascent until the close of the season the fish are carefully fed. At *Bizerta*, in *Tunis*, a small stream running into the sea has been widened just above the town into a shallow pond of 60 to 100 acres. The water is at no time much above the level of the sea, which occasionally flows back into the pond. The greater portion of the area is divided into 12 compartments by a cane fence, which separates the fish, but does not prevent the circulation of the water. Each compartment is said to contain a different kind of fish. The pond is under municipal control, and officers are appointed to manage it. The fish are said to be taken for an entire month from the same compartment, which is left undisturbed for the next 11 months. The profit to the town

amounts to \$12,000 or \$15,000 a year.—These are examples of fish culture as practised in former times, and do not include what the modern fish culturist considers the finest portion of his work, the taking of the eggs from the female fish, impregnating and hatching them. This art was discovered in 1741 by Stephan Ludwig Jacobi, a wealthy landed proprietor of Hohenhausen, in the duchy of Lippe, in north-western Germany, when a youth of seventeen years. His discovery was not made known to the public until 1763, when a writer in the Hanoverian magazine published his methods. French writers have ascribed the discovery to Dom Pinchon, in 1420, but there is no evidence that he did more than to transplant eggs which he found already fertilized. In 1771 George III., of England, recognized the importance of Jacobi's work and granted him a life pension.—In 1820 operations in France were begun by M. M. Ilivert and Pilachon, in Haute Marne, and four years later the art was introduced into Bohemia. In 1837 Mr. Shaw, in Scotland, practised artificial impregnation for the purpose of restocking the streams with salmon; and in 1841 Boccia, a civil engineer of Hammersmith, practised the art with trout on various estates. The following year Joseph Rémy, a fisherman of La Bresse, in the Vosges, it is claimed without knowledge of the labors of others, resorted to artificial impregnation as an adjunct to his business, restocking the Moselle and other streams from which he gained his livelihood. His operations, brought to the knowledge of Prof. J. J. C. Coste of the collège de France in 1849, gave an impetus to fish culture in Europe. The art was then confined to trout and salmon, and their method was to capture the fish and select those which were ripe, or about to spawn. This state was apparent by certain signs, as, softness of the belly and protrusion of the vent, with its purple color, in the females; and by the high color of the males. A female trout was taken in the left hand, and, by gently stroking the abdomen, the eggs were caused to flow into a pan of water. The male was handled in the same manner and a few drops of milt expressed, which impregnated the eggs. The latter were then placed in troughs, on fine, clean gravel, and a stream of cool water allowed to flow over them until they hatched. This system was improved by M. Coste, who, at Hünningen, in Alsace, adopted trays or troughs of earthenware, 25 in. long, 5 in. wide, and 4 in. deep, for hatching. The eggs were placed on *grilles*, formed of small parallel rods of glass arranged in a wooden frame resting on projections on each side of the tray, a little below the surface of the water, the bars being near enough together to hold the eggs, while dirt and the young fish when hatched fall between them and are removed through an aperture in the bottom of the tray. These trays were placed in shallow vessels, each a little above the other like steps, the water entering from a small jet

at one end of the upper trough and passing out at the other, traversing each trough in succession. This was further improved upon by Mr. C. G. Atkins, of Bucksport, Me., in 1871. He abolished both the gravel and the *grilles*, and used frames with bottoms of wire-cloth, which were coated with coal or gas tar, thinned with spirits of turpentine, to prevent rusting. This preparation is also used on all the wood-work which comes in contact with the water, and prevents exudation from the wood and is unfavorable to fungoid growths, while it imparts no taste to the water, if properly dried before using. Atkins placed several frames on each other, and thus multiplied the hatching capacity of troughs. In 1856 Mr. V. P. Vrascki, a Russian, discovered the method of dry impregnation and published it in the following year. This process consisted in taking the eggs in a pan in which the milt has first been placed, after dilution with a little water. This was published in the *Bulletin de la Société d'Acclimatation*, Paris, August, 1871, and translated in America by Mr. G. S. Page. Mr. Atkins also improved this method in 1871 by using no water until each egg had been placed in contact with the milt and had a chance to absorb it, undiluted. This gives a larger percentage of impregnation than when the milt is diluted. The trout egg will absorb liquid for nearly half an hour, after which, when fully distended, if it has not received a spermatozoon from the male, no power can impregnate it. Mr. Atkins published his account of this method in the Report of the U. S. Fish Commissioner for the years 1872-'3, p. 289.—The first fish hatching in America was done by Dr. Theodatus Garlick, near Cleveland, Ohio. In company with Prof. H. A. Ackley, in August, 1853, parent trout were obtained, the eggs extruded on the 21st of November, fertilized and hatched in January, 1874.—Trout ponds should be small if the object is to obtain many eggs, or to feed and grow the fish. Fish can then readily be seen. Except in a few instances, as the South Side Sportsman's Club of Long Island, where a great supply of water was found near where food can be cheaply obtained, trout culture for market has not been profitable, the time and labor being too great for small operations, or the expense of food too great for larger ones. It has paid in many cases to stock waters where the fish could have a large range and find their own food. Artificial hatching produces many fold more fish than are hatched in a state of nature; there is a much greater impregnation, and the eggs are protected from enemies, such as sunlight, sediment, and the numerous things which eat them, including fishes, birds, reptiles, insects, and mammals. During the process of hatching, the troughs should be examined daily to see that the flow of water is sufficient, and to remove defective eggs. The added eggs turn milk-white, and are easily seen among the transparent ones, which somewhat resemble amber. Under the old system of hatching on

gravel there would be some dead ones which would escape observation in it, and which would develop a fungous growth; hence the older writers on the subject regarded "byssus" as the deadliest foe of the fish breeder. With the present system of wire trays it must be a careless fish culturist who allows it to be present in his troughs. The period of incubation of trout eggs varies with the temperature. At 37° it is 165 days; at 39°, 121; at 41°, 103; at 44°, 81; at 46°, 56; at 50°, 47; at 52°, 38; and at 54°, 32 Fahr. When the trout are first hatched they have an umbilical sac, about three times the size of the body, which furnishes them sustenance for a period varying, with the temperature of the water in which they are hatched, from 77 days at 38½°, to 60 at 40½°, 46 at 43½°, and 30 at 50° Fahr. When the sac is absorbed they require food, which may consist of curd, fresh shad, herring or other fish roe, raw or boiled, the yolks of eggs boiled hard, coagulated blood, liver raw or boiled, &c., which should be made fine. When they outgrow the hatching troughs, they are let into the nurseries, and should be furnished with sunlight. For the adult trout similar food will suffice, maggots bred in decaying meat being perhaps the most nutritious. One great advantage of artificial breeding consists in the large proportion of eggs and fry that are saved from destruction. In the natural state these are the prey of frogs, aquatic birds, various species of fish, and numerous water insects. Fecundated ova, after the first formation of the fish is seen, may be transported without injury, if packed in moist moss in a box which is inclosed in another with the space between filled with sawdust or other non-conducting material. They are also placed on trays having canton flannel bottoms. These trays are placed above each other in a tin box, which is surrounded by ice. In this way the U. S. Fish Commission has sent hundreds of thousands of the eggs of the Californian salmon, land-locked salmon, trout, and white-fish to Europe. At a temperature from 5° to 15° above freezing point they may be kept packed for two weeks; and even after the lapse of six weeks they have been found uninjured. The fry and adult fish may be transported in barrels or smaller vessels, care being taken to change the water and have it properly oxygenated.—The spawn of salmon requires a somewhat longer period of incubation than that of trout in water of the same temperature.—The spawn of shad is hatched in 72 hours in water at a temperature of 78°, and in seven days when the temperature is 60°. The umbilical sac sustains the fry only from three to six days. The original shad-hatching apparatus is a box with a bottom of wire gauze, sustained in the water by two float bars fastened to the sides at an angle with the top. This is anchored in the stream, in a gentle current which passes freely through the gauze and buoys up the eggs within. When hatched, the fry are liberated in mid-

stream, the young shad instinctively seeking the main current, where they are comparatively free from the small fish most likely to devour them. The eggs after life is observed in them have been kept at a low temperature for six days when packed in damp moss, and it is possible to transport them a long distance. The spawn of both shad and salmon is obtained in much the same manner as that of trout. An important improvement in shad hatching was discovered by Mr. Fred Mather, in 1875. It consists of a cone which admits the water at the bottom and allows it to flow out at the top, with a screen at both places.—The eggs of shad require to be buoyed up by a current of water and kept in motion, a requirement met by the cones, which render it possible to carry on the work of hatching on shore, or on board a vessel. Mr. T. B. Ferguson, in 1877, devised a system of plunging buckets, to be worked by steam, by the side of a vessel, which were extensively used by the U. S. Fish Commission. They kept the eggs in motion by alternately lifting and dropping the cylinders with wire-cloth bottoms, which contained the eggs, into the water. The "Universal" hatching jar, invented by Col. M. McDonald, is, with the Mather cones, now used in all the shad-hatching operations of the U. S. Fish Commission, the former in the central station at Washington, and the latter on the steamer Fish Hawk. Shad have not only been increased in the rivers to which they are native, but have been successfully established in the rivers of California, and specimens have been taken in the upper Mississippi, Ouachita, and other streams where they have been placed.—The French government early gave its patronage to fish culture, and the barren waters of the country have been stocked with appropriate fish: the rivers with salmon, the brooks with trout, and the sluggish streams, lakes, and ponds with carp, perch, eels, and pike. The establishment at Hünigen was erected under the patronage of the government through the exertions of Prof. Coste in 1852. The buildings form a square comprising at the sides two hatching galleries 65 yards long and 9½ yards wide, containing tanks and egg-boxes. The buildings and ponds cover 80 acres. The water is supplied from springs on the ground, from the Rhine, and from a small stream called the Angraben. The establishment does not in general breed fish except by way of experiment, the chief business being the collection and distribution of eggs, which are brought mostly from Switzerland and various parts of Germany, and embrace those of several species of trout, the Danube and Rhine salmon, and the *ombre chevalier*. The commonest fish is the *fera*, similar to the white-fish of the United States. The spawn collected from various sources is carefully tended until it is sent to some point in need of it. With the cession of Alsace and Lorraine, this establishment passed into the hands of the Germans, and is now

conducted on a still larger scale under the auspices of the German fishery association; and success has attended the efforts to restock the Rhine and other streams. In its stead the French government have established another at Montbéliard, in addition to those already in operation at Clermont-Ferrand and elsewhere.—The German fishery association (Deutscher Fischerei Verein) is a body of able and influential men, comprising some of the foremost men in the German parliament. It has done much to advance the cause of fish culture, not only within the empire, but its influence has been felt in all parts of Europe.—In England but little has been done except among wealthy gentlemen, wholly as a pastime or for an ornament to parks. In 1882 the National Fish Culture Association was formed, with Hon. Edward Birbeck, M. P., as president, and W. Oldham Chambers as secretary, with permanent headquarters at the Exhibition Grounds at South Kensington, and the association is rapidly growing. It is awakening an interest in the subject which may cause the government to do something for fish culture. The association is about to begin practical operations at an experimental station, leased for the purpose, where both native and foreign fishes will be bred. An aquarium with both salt- and fresh-water tanks has been erected in the South Kensington Museum, where the habits of fishes will be observed. The English government has not made any appropriation for this purpose, but the inspectors of salmon fisheries, whose principal duty is to preserve the streams from over fishing or from fishing at unlawful times, have interested themselves somewhat in fish culture. The late Mr. Frank Buckland established what he called a "Museum of Economic Fish Culture" at South Kensington, which was mainly a collection of plaster casts of fishes. He sent spawn of salmon and trout to Australia, as did other fish culturists.—In Scotland, more attention has been paid to the subject than in England. The salmon-breeding establishment at Stornoway on the Tay, about five miles above Perth, has been in operation since about 1850. The result of the operations there has been a large increase in the numbers of salmon taken in the Tay, and in the rental of its fisheries. There is also an establishment at Tonguehead on the Dee, where the hatching boxes are protected from the weather, occupying a room 70 ft. long in a lumber storehouse connected with a bakery. Sir James G. Maitland, Bart., has since established a hatchery and ponds on a larger scale at Howetown, near Stirling.—Several successful attempts at fish culture have been made in Ireland, notably by Mr. Ashworth on the Galway, and by Mr. Cooper on tributaries of the Ballisodare, those rivers having been stocked with salmon, and stairways having been built to enable the fish to ascend falls before impassable. Salmon have also been introduced into the Doo-hulla river, so called, which consists of several small lakes, originally

connected with the sea by a tortuous brook, impassable by fish unless swollen by heavy rains, when white trout occasionally ascended. The upper lakes have been connected with the lower one by an artificial cut, and this by another artificial channel with the sea, so that the waters are accessible to salmon.—The most noteworthy Norwegian experiment is that of Prof. Rasch, of the university of Christiania. The locality is a deep fiord, which runs up into the land about a mile, narrowing at the end to the width of a large trench, and opening out beyond into a basin about 800 acres in extent, with an average depth of 40 ft. Across the inlet Prof. Rasch in 1869 erected a fence which does not prevent the ebb and flow of the tide, but bars the outward passage of the fish. Within the enclosure a hatching apparatus for salmon and sea-trout spawn was set up, connecting with two small fresh-water ponds, supplied by a spring. The young fish are fed for a time in the ponds on fine-chopped mussels, which are found in the basin in abundance, and are then turned into the salt-water basin. This experiment has shown that sea trout may be reared without access to the sea.—In the United States fish culture stood still after the experiments of Dr. Garlick, in 1853, until Mr. Stephen H. Ainsworth, of West Bloomfield, N. Y., began it on a small scale about 1865. This attracted the attention of Mr. Thaddeus Norris, of Philadelphia; Mr. Seth Green, of Rochester; Mr. Livingston Stone, of Charlestown, N. H.; Mr. Fred Mather, of Albany; and others who embarked in it. At first it was confined to brook trout entirely, and, as the business obtained a notoriety through the newspapers, the pioneers turned their attention to supplying eggs and fry for stocking ponds, that being more profitable than raising the fish. Trout ponds sprang up all over, but it was found that only in exceptionally favorable localities could it be made profitable. The cost of food and attendance was so great that no margin of profit was left. The exceptions were where the fish could find abundance of natural food, as in streams emptying into lakes, and on Long Island, where the trout can run down into salt or brackish water and get an abundance of food.—Legislative action was first taken by the New England states, which were followed by others, until now commissioners of fisheries exist by law in 84 states and territories, viz.: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, Alabama, Ohio, Michigan, Illinois, Indiana, West Virginia, Tennessee, Georgia, North Carolina, South Carolina, Missouri, Arkansas, Nebraska, Kansas, Texas, Minnesota, Iowa, Colorado, Utah, California, Nevada, Wisconsin, and Kentucky. Canada has a commission which looks after the fish-cultural interests and has done much good work in restocking exhausted rivers. The efforts of these commissioners have been

directed entirely to the restocking of rivers and ponds, to the erection of fishways around falls and dams, and to the procuring of protective legislation forbidding the taking of fish during the spawning season, and regulating the use of nets and the more destructive means of capture.—By the act of congress of Feb. 9, 1871, a United States commissioner of fish and fisheries was provided for, whose duty it was made to prosecute investigations, with a view of ascertaining whether any and what diminution in the number of the food fishes of the coast and lakes had taken place, and to what cause such diminution was due, as well as what remedial measures, if any, should be adopted. Prof. Baird, of the Smithsonian Institution, was appointed commissioner. Under his management the treatment of fish culture has extended to marine fishes as well as to those living in and entering fresh waters. Experiments have been made with several kinds of marine fishes, such as the cod, the pollock, the moon-fish (*Parephippus faber*), and the Spanish mackerel (*Cybbium maculatum*).—The steamer Fish Hawk was built for the U. S. Fish Commission and fitted up with hatching cones and buckets for work on shad rivers and for hatching sea-fish in harbors, thereby enabling one set of machinery to be of use at different times at widely different places. Among the other triumphs of the U. S. Fish Commission is the introduction of the German carp, which were brought over in May, 1877, by Dr. R. Hessel, acting for Prof. Baird. He brought 227 carp of the mirror and leather varieties, and 118 scale carp, which were placed in the ponds of the Maryland Commission, at Druid Hill Park, Baltimore. In the same year the national carp ponds were established near the "Monument lot," Washington, D. C., and many acres of swampy, unwholesome land were turned into large and handsome ponds. The carp grew faster than in their native land, and at three years old some specimens weighed 12 lbs. This fish, from its quiet habit, its vegetarian diet, and its love of warm, sluggish water, combined with its rapid growth, has become a great favorite in regions like the inland and southern states, where the conditions are favorable to its growth, and where there are no other good table fish. Although many thousands of young, from 2 to 3 in. in length, have been sent to almost every state in the Union for the past two years, the demand yet exceeds the supply. They have thriven in all waters where they have been placed, where it has not been too cold, but they grew faster in the South, where the winters are milder and the period of hibernation is shorter. Their growth only continues through the hottest weather, and no waters have yet proved to be too warm for them. Their culture is simple; their eggs are glutinous and are attached to weeds where they hatch, no manipulation being necessary. They can be turned into ponds and left to increase in their own manner, or they may have

a breeding pond prepared into which they may be driven at night and turned out of it in the morning, so that they may not eat the eggs deposited. This breeding pond may be merely a shallow portion of the main pond, and should not be over 2 ft. deep. Carp are easily sent from one part of the country to the other without an attendant. Mr. E. G. Blackford, of Fulton market, New York, and a member of the N. Y. Fish Commission, has sent them in cans by steamer from New York to Florida safely. In May, 1881, the same gentleman sent out thirty carp to Ecuador in a steamship. They were destined for the plantation of Signor Jijon near Quito, from which place they were carried on the backs of men a ten days' journey over the mountains before reaching their destination. The heat is intense there, and the attendant was instructed to aerate, but not change the water. They arrived safely and were deposited in ponds, and have bred.—The following works on fish culture have been published in America: "A Treatise on the Artificial Propagation of Fish," by Theodatus Garlick, M. D. (Cleveland, O., 1858; a second edition, 1880); "Artificial Fish-Breeding," W. A. Fry (New York, 1866); "American Fish Culture," Thaddeus Norris (Phila., 1868); "Trout Culture," Seth Green (Caledonia, N. Y., 1870); "Domesticated Trout," Livingston Stone (Boston, 1872; a third edition, 1877); "Practical Trout-Culture," J. H. Slack, M. D. (1877); and the Reports of the U. S. Fish Commission for 1871-'72; 1872-'73; 1873-'74-'75; 1875-'76; 1877; 1878; 1879; 1880; 1881; 1882; together with the Bulletin of the U. S. Fish Commission, a yearly volume begun in 1881 and continued each year; the reports of the different state commissions, mostly annual. In addition to this, all news relating to fish-culture is published weekly in a department of a weekly journal ("Forest and Stream," New York). The annual meetings of the American Fish Culturists' Association, organized 1872, and of the Central Fish Cultural Society at Chicago, organized 1879, attract much attention, and valuable papers are read at each which are published in their reports.—On the first day of April of each year, the date when it is lawful to catch or sell brook trout in the state of New York, a grand display of cultivated trout is made in Fulton market, by Mr. E. G. Blackford, of the first-named association. Trout are sent from all the Eastern states and from California and Nevada, as well as specimens obtained from Europe. This display attracts not only fish culturists, but people of all conditions, to see the beautiful exhibit.—A notable event in the fish cultural history of the world was the International Fishery Exhibition at Berlin in 1880. This exhibition, though general in its scope and covering everything obtained in any manner from the water, was intrinsically an exhibition for fish culture, and was under the management of the Deutsche Fischerei Verein. Congress appointed Prof. S. F. Baird as commissioner for

the United States to the exhibition. It being impossible for him to attend it, he deputized Prof. G. Brown Goode in his stead. The latter selected as his staff Fred Mather, fish culturist; F. W. True, custodian; Capt. W. J. Collins, fisherman; and J. Palmer, taxidermist. The grand prize was awarded to Prof. Baird for the best collection illustrating the fisheries, and the following countries took prizes in the department of fish culture:

COUNTRIES.	Gold Medals.	Silver Medals.	Bronze Medals.	Honorable Mention.
United States..	6	1	1	2
Germany.....	3	1	3	11
Russia.....	1	1	1	1
Norway.....	..	1	..	1
Sweden.....	..	1	..	..
Austria.....	..	..	1	..
Switzerland....	..	..	1	..

Since this exhibition, which opened March 20th, and closed June 20, 1880, there have been several local fishery exhibitions held in Germany, and a national one at Norwich, England, in April, 1881, an international one in Scotland, at Edinburgh, in 1882, and a grand international one at London, 1888. This latter was the largest of any yet held, and the United States again carried off the first prize for the most complete exhibit; Prof. Goode again had charge of the American collection, which was largely made from the National Museum at Washington.—The fact that the eggs of different species of fish differ so much in their character as to require entirely different treatment makes the fish culturist approach a new species with caution. The treatment that will hatch a salmon egg will kill the ova of a cod or a shad. All the salmon family, except the smelt, have eggs which are free from each other and are laid in the gravel. The eggs of the smelt, like those of the herring, alewife, carp, and many cyprinoids, are free from each other, but have a mucous coating, which adheres to what they first come in contact with. The eggs of the shad require to be buoyed in water, while those of the cod float. Others, as the yellow perch, lay them in long strings, over twigs, and the eggs of the "silver-sides," or "frier" (*Chirostoma notata*), and of the "silver gar" (*Belone longirostris*), have threads that attach to objects in the water; the sticklebacks have a button-shaped appendage on one end of the egg which is attached to the egg membrane. There are still other modes of reproduction among the bony fishes, for the viviparous perch (*Embiotocidae*) of California bring forth their young alive, and the little cyprinodonts (killy fishes) and the eel-pout (*Zoarces anguillaris*) are more or less viviparous. The cyprinodonts copulate, but whether they lay eggs or hatch them before extrusion is not yet definitely known. See Reports of the U. S. Fish Commission; Circulars of the Deutsche Fischerei Verein; *Die Fischzucht*, by Max von dem Borne (Berlin, 1881); "American Fish Culture," by T. Norris (Phila., 1868); "Artificial Propagation of Fish," by T. Garlick (Cleveland, 1881); *Instructions sur la pisciculture*, by Prof. Coste (Paris, 1856); *Multiplication artificielle des poissons*, by J. P. Koltz (Brussels, 1858); "Ancient and Modern Fish Tattle," by C. D. Badham (London, 1854); "Epochs in Fish Culture," by Prof. G. Brown Goode ("Forest and Stream," 1881); "Harvest of the Sea," by J. G. Bertram (London, 1865 and 1869; New York, 1866); "The Sea and its Living Wonders," by Dr. G. Hartwig (London, 1866); "Artificial Fish Breeding," by W. H. Fry (New York, 1866); *La boutique de la marchande de poissons*, by Martial Delherpyon (Paris, 1867); "Practical Trout Culture," by J. H. 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At Gloucester, Mass., a few cod-eggs were hatched by Capt. H. C. Chester, of the U. S. Fish Commission, in 1879, in a semi-rotating cylinder devised by him. Since that time the Commission has established itself permanently at Wood's Holl, Mass., for summer investigations and for experiments in fish culture at all seasons. Capt. Chester found great difficulty in keeping the eggs floating on account of sediment attaching to them, and his last device is a bottomless frame, three feet deep, six feet long and two feet wide, set in a water-tight tank. The corners of this inside frame are rounded, and four jets about a foot below the surface of the water cause a continuous current in one direction, the water escaping below, and the eggs either floating or are submerged a few inches. Large ponds have been made to store sea fishes in.—At Cold Spring Harbor, on the north shore of Long Island, the New York Fish Commission has a station. Here, in addition to the fresh-water work with salmon, trout, white-fish, smelts, etc., there is a large pond, with a flood-gate to hold the tide at low water, from which an engine pumps one thousand gallons per hour into a reservoir on the hill above. From this upper reservoir pipes lead into the hatchery, and to the McDonald jars and Chester cod-hatchers. Owing

to the fact that the eggs of different species of fish differ so much in their character as to require entirely different treatment makes the fish culturist approach a new species with caution. The treatment that will hatch a salmon egg will kill the ova of a cod or a shad. All the salmon family, except the smelt, have eggs which are free from each other and are laid in the gravel. The eggs of the smelt, like those of the herring, alewife, carp, and many cyprinoids, are free from each other, but have a mucous coating, which adheres to what they first come in contact with. The eggs of the shad require to be buoyed in water, while those of the cod float. Others, as the yellow perch, lay them in long strings, over twigs, and the eggs of the "silver-sides," or "frier" (*Chirostoma notata*), and of the "silver gar" (*Belone longirostris*), have threads that attach to objects in the water; the sticklebacks have a button-shaped appendage on one end of the egg which is attached to the egg membrane. There are still other modes of reproduction among the bony fishes, for the viviparous perch (*Embiotocidae*) of California bring forth their young alive, and the little cyprinodonts (killy fishes) and the eel-pout (*Zoarces anguillaris*) are more or less viviparous. The cyprinodonts copulate, but whether they lay eggs or hatch them before extrusion is not yet definitely known. See Reports of the U. S. Fish Commission; Circulars of the Deutsche Fischerei Verein; *Die Fischzucht*, by Max von dem Borne (Berlin, 1881); "American Fish Culture," by T. Norris (Phila., 1868); "Artificial Propagation of Fish," by T. Garlick (Cleveland, 1881); *Instructions sur la pisciculture*, by Prof. Coste (Paris, 1856); *Multiplication artificielle des poissons*, by J. P. Koltz (Brussels, 1858); "Ancient and Modern Fish Tattle," by C. D. Badham (London, 1854); "Epochs in Fish Culture," by Prof. G. Brown Goode ("Forest and Stream," 1881); "Harvest of the Sea," by J. G. Bertram (London, 1865 and 1869; New York, 1866); "The Sea and its Living Wonders," by Dr. G. Hartwig (London, 1866); "Artificial Fish Breeding," by W. H. Fry (New York, 1866); *La boutique de la marchande de poissons*, by Martial Delherpyon (Paris, 1867); "Practical Trout Culture," by J. H. Slack (New York, 1877); "Fish Hatching and Fish Catching," by Roosevelt and Green (Rochester, N. Y., 1879); "An Essay on Fish Culture," by John H. Klippart (Columbus, O., 1878); "Domesticated Trout," by Livingston Stone (Boston, 1877); also the annual reports to the Canadian government, and the proceedings of the American fish culturists' association, and of the *Société d'Acclimatation*. The most important invention yet made in the apparatus for the propagation of fishes is the fishway invented by Col. M. McDonald, of the U. S. Fish Commission, which can be built on a steeper incline than any other, and is so arranged that at the sides the water actually runs up the inclined chute. These fishways are now in operation on the Oswego river, New York, and on the Savannah river, Ga., and one will soon be built at the Great Falls of the Potomac. Very little has been done in a practical way with the eggs of sea fishes beyond the experiments referred to above. At Gloucester, Mass., a few cod-eggs were hatched by Capt. H. C. Chester, of the U. S. Fish Commission, in 1879, in a semi-rotating cylinder devised by him. Since that time the Commission has established itself permanently at Wood's Holl, Mass., for summer investigations and for experiments in fish culture at all seasons. Capt. Chester found great difficulty in keeping the eggs floating on account of sediment attaching to them, and his last device is a bottomless frame, three feet deep, six feet long and two feet wide, set in a water-tight tank. The corners of this inside frame are rounded, and four jets about a foot below the surface of the water cause a continuous current in one direction, the water escaping below, and the eggs either floating or are submerged a few inches. Large ponds have been made to store sea fishes in.—At Cold Spring Harbor, on the north shore of Long Island, the New York Fish Commission has a station. Here, in addition to the fresh-water work with salmon, trout, white-fish, smelts, etc., there is a large pond, with a flood-gate to hold the tide at low water, from which an engine pumps one thousand gallons per hour into a reservoir on the hill above. From this upper reservoir pipes lead into the hatchery, and to the McDonald jars and Chester cod-hatchers. Owing

to storms in December, 1884, the main spawning season of the cod, a later run of fish spawning in April, no eggs were obtained, but many thousands of tomcod, *Microgadus pruinosa*, were hatched and liberated. The eggs of the tomcod are heavier than those of the cod, and can be hatched in any form of jar or cone which is used for eggs that do not float; they hatch in twenty-six days at temperatures varying from 86° to 48° Fahr. The tomcod spawns in November and December along the docks and among the stones. It sometimes grows to a foot in length, but averages about six inches, and is highly esteemed. It is the intention to experiment with all the edible salt-water fish whenever their eggs can be obtained. Two attempts have been made to introduce the turbot and the sole from Europe into American waters, and a few were planted, but the number was too small to expect any success from. Now that large ponds of salt water have been made at Wood's Holl and Cold Spring Harbor, they can be better cared for and turned out at the proper time. No attempts have ever been made to breed any of the flat fishes artificially, and but little is known of their spawning habits, or of the character of their eggs. Nothing marks the rapid progress in the breeding of fishes more than the exchange of species between Europe and America, and the very great increase of the number of publications that relate to fish culture.

FISHER, a carnivorous digitigrade mammal, belonging to the family *mustelidae*, subfamily *martinae*, and genus *mustela* (Linn.); this animal (called also Pennant's marten, black cat, and pekan) and the pine marten are the only two species of the genus found in North

on the inner side, indicating a less sanguinary disposition than that of the weasels. The general appearance is fox-like; the head is long and muzzle rather pointed; the ears short, rounded, and wide; the eyes large; body slender; tail long and bushy at the base; feet short, stout, and armed with strong sharp claws, five on each foot; no anal pouch, but a small gland which secretes a musky fluid. The fur is of two kinds, the outer long and coarse, the inner fine and soft. The general color is blackish, with a grayish tinge on the head and shoulders; some specimens are brownish, and a few with light tints; there is sometimes a white spot on the throat. Specimens vary so much in size and coloration that it has been supposed that two species are confounded under the name. A specimen measuring 28 in. in length of body, with the tail 14 in., would weigh about 8½ lbs. Occasionally seen in Pennsylvania and New York, and even as far south as North Carolina, it is common in Canada and in the Lake Superior mineral region; it is found as far north as lat. 63°, and across the continent to the Pacific. It is eminently an arboreal species, very agile, though less so than the squirrel, which it is fond of pursuing; it is generally nocturnal in its habits; it preys upon hares, raccoons, squirrels, grouse, mice, and any small bird or quadruped which it can seize. Though called fisher, there is no certain evidence that it catches fish, but it is fond of the fish with which the hunter baits his traps for the pine marten; in this respect the fisher is a great nuisance, as it breaks into the traps from behind, sometimes robbing every one in a line of miles, escaping itself and preventing the capture of the more valuable pine marten. Fishers have been often kept in confinement, where they become docile if taken when young; but the temper is very changeable, and they quickly become angry without apparent cause. From their agility, strength, and ferocity, they are difficult to obtain unless severely wounded. Like the other fur-bearing animals, the fisher's pelage is finest in winter and in high latitudes; a skin is worth about \$1 50, while that of the smaller pine marten is worth \$2 50; their fur is not much used in the United States, but is generally sent to Europe, where it is used for linings of more costly furs, for trimmings, and for robes. It brings forth its young once a year toward the end of spring, from two to four at a birth, depositing them in hollows in trees at a considerable height above the ground. This animal is called by Schreber *M. Canadensis*.

FISHER, ALVAN, an American artist, born in Needham, Mass., Aug. 9, 1792, died in Dedham, Mass., Feb. 16, 1863. He began the study of painting at the age of 18, with an ornamental painter of merit named Pennyman. In 1814 he commenced his professional career as a portrait painter, and soon after undertook barnyard scenes, winter pieces, portraits of animals, and in general scenes belonging to

Fisher (*Mustela Pennanti*).

America. The fisher (*M. Pennanti*, Erxl.) is the largest known species, the length of the body being over 2 ft., and the tail 1½ ft. The dental formula is: incisors $\frac{3}{1}$, canines $\frac{1}{1}$, premolars $\frac{4}{2}$, molars, $\frac{1}{1} = \frac{1}{1}$, 38 in all; the lower carnivorous tooth has a rounded lobe

rural life in which cattle are prominently introduced. He subsequently returned to portrait painting, which he practised for many years in Boston.

FISHER, George Park, an American scholar, born in Wrentham, Mass., Aug. 10, 1827. He graduated at Brown university in 1847, and studied theology in the divinity school of Yale college and in that at Andover, Mass. In 1853 he visited Germany, where he continued his theological studies. He was appointed professor of divinity in Yale college on his return from Europe, and, in connection with his professorship, he was ordained as pastor of the college church, Oct. 24, 1854. After a period of seven years he resigned his office, and in 1861 was elected professor of ecclesiastical history in Yale divinity school. The degree of D. D. was conferred upon him by Brown university in 1866. He has been a frequent contributor to the "New Englander," of which quarterly he has since 1866 been one of the editors. In 1865 he published a volume entitled "Essays on the Supernatural Origin of Christianity, with special reference to the Theories of Renan, Strauss, and the Tübingen School" (enlarged ed., 1871). He delivered in 1871 a course of lectures at the Lowell institute, Boston, on the reformation, and from these resulted a volume on the "History of the Reformation" (1873).

FISHER, John, an English prelate, a zealous opponent of the reformation, born in Beverley, Yorkshire, in 1459, beheaded June 22, 1535. Having become the confessor of Margaret, countess of Richmond, he induced that lady to found St. John's and Christ's colleges at Cambridge. In 1501 he became chancellor of that university, and in 1504 bishop of Rochester. He has been supposed to have written the treatise *Assertio septem Sacramentorum*, for which Henry VIII. obtained the title of "Defender of the Faith." Though long favored by the king, Fisher fell under his displeasure by his opposition to the divorce of Catharine of Aragon. On the question of the king's spiritual supremacy being broached in 1531, the bishop firmly refused to acknowledge it. He further fell into disfavor, and was arraigned for misprision of treason, for concealing certain prophecies of Elizabeth Barton, called the holy maid of Kent, respecting the king's death. For this offence he was condemned to imprisonment during the king's pleasure, but was released on paying a fine of £300. Refusing to take the oath of allegiance in 1534, he was committed to the tower, attainted, and his bishopric declared vacant. Pope Paul III. took the opportunity to create him a cardinal; but Henry having sent Cromwell to interrogate him with regard to the appointment, and being informed that he would accept the cardinal's hat, exclaimed: "Mother of God! he shall wear it on his shoulders then, for I will leave him never a head to set it on!" The aged bishop was at once condemned on the

charge of denying the king's supremacy, and was beheaded. He wrote a commentary on the seven penitential psalms, sermons, and controversial and devotional treatises. His life has been written by the Rev. J. Lewis (2 vols. 8vo, London, 1854-'5).

FISHERIES, the business of catching fish, and the localities frequented by the kinds of fish that are objects of capture, such as the cod, herring, mackerel, and salmon. The whale fishery and the seal fishery are terms employed to designate the pursuit of the whale and the seal, though those animals are not fishes. (See **WHALE FISHERY**, and **SEAL FISHERY**.)—Among the ancients, fisheries were carried on extensively from a very early period, and formed a valuable branch of industry. Byzantium (the modern Constantinople), and Sinope on the Black sea, were famous for their lucrative fisheries. From Suetonius we learn that the *muræna* or lamprey, the favorite fish of the Romans, was caught in the greatest abundance in the sea around Sicily, and in the Carpathian sea between Crete and Rhodes. In the 3d century of our era the fishermen of the Mediterranean pursued their prey not only on the coasts, but in the open sea, making long voyages, and even passing the pillars of Hercules. The fisheries of Egypt were especially celebrated for their productiveness, but they were all inland, in lakes, canals, and the river Nile. The revenues arising from the fisheries of Lake Mœris were given to the queen of Egypt for pin money, and are said to have amounted to nearly \$500,000 annually.—The earliest mention of the herring fishery that has reached us dates from A. D. 709. The cod fishery began to be regulated by legislation in western Europe toward the end of the 9th century. From an ordinance of Charles VI. in 1415 it appears that the mackerel fishery of France at that period was very extensive, and that the fish were sold at an extremely low rate in the markets of Paris. The development of the fisheries during the middle ages was greatly promoted by the demand for fish created by the fasts of the church. But the discovery, at the end of the 15th century, of Newfoundland and its fisheries, which to this day surpass all others in magnitude and value, gave the greatest impulse to the business. The cod, mackerel, and herring are the chief objects of pursuit, and their range is not limited to the neighborhood of Newfoundland, but they are caught in vast numbers on the coast of New England, in all the bays and inlets of the British maritime possessions, and on the coast of Labrador. The French were the first Europeans who engaged in the American cod fishery. They visited Newfoundland as early as 1504. In 1508 Thomas Aubert made a fishing voyage from Dieppe to the gulf of St. Lawrence, and after that the Newfoundland fisheries increased so rapidly that in 1517 they gave employment to 50 vessels from different nations, chiefly, however, from France. In 1577 there were 160 French

vessels engaged in the business, which they pursued with great success. A few years later the government of Henry IV. took active measures to protect and encourage the cod fishery. Early in the 17th century, however, the business began to decline, so that in 1645 the number of French vessels employed in it was 50 less than in 1577. At this period began those contests between the French and English about the sovereignty of the fishing grounds, which continued more than a century. After the treaty of Ryswick in 1697, the French claimed the exclusive ownership of the American fisheries east of the Kennebec river in Maine, except on the W. coast of Newfoundland, where, by a specific stipulation of the treaty, the English were permitted to fish. By the treaty of peace of 1713, however, the French fishermen were prohibited from coming within 30 leagues of the coast of Nova Scotia, but they were granted the privilege of fishing on the E. coast of Newfoundland, from Cape Bonavista to the northern point, thence along the western shores as far as Point Riche. Notwithstanding the restrictions of this treaty, the French continued to pursue the fisheries with energy and success. They settled on the island of Cape Breton, where they built the town and fortress of Louisburg, at an expense of 30,000,000 livres, which became the great rendezvous of their fishermen. In 1721 their fleet of fishing vessels is said to have increased to 400 sail, a greater number than at any former period. In 1744 they had 564 vessels, manned by 27,500 men, and producing 1,441,500 quintals of fish, valued at \$4,500,000. After the fall of Louisburg in 1745 the fleet declined to about 100 sail. By the treaty of Paris in 1763 it was agreed that the French should have the liberty of fishing and drying fish on a part of the coasts of Newfoundland, and of fishing in the gulf of St. Lawrence at the distance of three leagues and upward from the shore, and on the coasts of Cape Breton at the distance of 15 leagues from the shore. The little islands of St. Pierre and Miquelon near the S. coast of Newfoundland were ceded to France to serve as shelter for the French fishermen. A few years later, in 1768, the number of French vessels at Newfoundland had increased to 259. By the treaty of peace in 1783 the right of the French to Miquelon and St. Pierre was confirmed, but their right to fish on the E. coast of Newfoundland between Cape Bonavista and Cape St. John was abandoned, and extended on the W. coast from Point Riche to Cape Ray. The French revolution was disastrous to the fisheries, and in 1792 fewer than 3,400 Frenchmen were engaged in the North American seas. During the reign of Napoleon they continued to languish, and the fishermen met with severe losses from the British cruisers. After the peace of 1815 the business rapidly increased, and from 1835 to 1889 the cod fishery employed an average of 416 vessels, with an aggregate tonnage of 53,456; from 1842 to 1847, 889

vessels of 49,165 tons, of which 21,195 tons were employed on the coast of Newfoundland, 657 at St. Pierre and Miquelon, 5,816 on the Grand bank, 13,703 on the same without drying, and 7,794 at Iceland. From 1841 to 1850 the number of men averaged 11,500; in 1852 the number of vessels was 450, and of men 14,000; in 1858, 492 vessels of 77,150 tons and 15,280 men; value of product, \$3,500,000. In 1869, 676 vessels, manned by 14,149 men, produced about 670,000 quintals of cod and its products. In 1870, 188 vessels and 7,000 men were employed in the Newfoundland fishery, and 299 vessels, with 5,000 men, in the Iceland fishery. The protection and encouragement of this great branch of national industry has from its commencement been sedulously attended to by the French government. Bounties to a large amount are granted to the fishermen. At present (1874), under a law passed in 1851, the bounties to the cod fisheries are as follows: for each man of the crew of a vessel employed on the coast of Newfoundland or Iceland, 50 francs; for each metric quintal (220½ lbs.) of dry codfish, 20, 16, or 12 francs, according to the country to which it is shipped, the highest bounty being given on codfish shipped to the French colonies in America, India, and the W. coast of Africa. The bounty paid from 1841 to 1850 averaged \$780,000 a year; in 1858 it amounted to \$785,000, and in 1869 to \$430,000. The French herring fishery is of great importance, and is carried on chiefly from Boulogne, Fécamp, Dieppe, Saint-Valéry-en-Caux, Gravelines, Courseulles, and Berck. The following table exhibits the number of vessels engaged, with the tonnage and men, and the quantity of herring taken, during the most recent period of six years for which statistics are attainable:

YEARS.	Vessels.	Tons.	Men.	PRODUCE, CWT.		
				Salt.	Fresh.	Total.
1864	796	21,815	10,027	206,022	268,928	469,950
1865	746	21,832	10,277	247,564	348,256	595,820
1866	790	24,034	10,669	259,776	199,668	459,444
1867	796	22,757	10,692	248,112	194,216	442,328
1868	742	23,207	10,429	314,560	214,122	528,682
1869	788	26,726	11,150	270,150	182,140	452,290

Another valuable French fishery is that of sardines, which is carried on both in the Mediterranean and on the coasts of Brittany. The total value of the French fisheries in 1866 was \$10,965,707, viz.: cod, \$2,725,329; sardines, \$1,369,787; herring, \$1,357,437; mackerel, \$490,575; oysters, \$307,535; shrimps and other crustacea, \$294,478; mussels, \$268,709; sea shells, \$191,002; the rest miscellaneous. In 1871 the whole number of vessels and boats engaged in the fisheries of all kinds was 18,407, having an aggregate tonnage of 142,774, and employing 110,486 hands, including 60,635 men and 39,861 women and children engaged in the coast fisheries. The value of the catch was \$13,978,451; in 1870, \$11,975,460.

The imports of products of the sea in 1868 were valued at \$8,084,900, of which \$7,606,000 were for consumption; in 1869, \$8,817,000, of which \$8,479,000 were for consumption. Of these amounts about half are cod and cod oil, the product of the national fisheries. The other principal items in 1869 were fresh-water fish to the value of \$525,000; herring, \$252,000; stockfish, \$84,000; other fish, fresh, dry, salted, or smoked, \$478,000; fish, pickled or preserved in oil, \$180,000; lobsters, \$169,000; oysters, \$497,000; cod and mackerel roes, \$948,000; whale and other fish oil, \$510,000; whalebone, \$289,000; crude coral, \$428,000; fine pearls, \$245,000. The exports in 1868 amounted to \$4,675,000, of which \$4,512,000 were the product of the domestic fisheries; in 1869, to \$4,166,000, of which \$3,892,600 were domestic. In the latter year the chief items were 54,415 quintals of salted cod, valued at \$321,000; 20,922,946 lbs. of sardines, worth \$2,858,000; and 1,108,507 lbs. of other fish, pickled or preserved in oil, valued at \$305,000.—Spain participated in the fishery excitement following the discovery of America, and vessels from that nation visited Newfoundland as early as 1517. Sixty years later 100 vessels were employed in the fishery, but the number rapidly declined, and about the middle of the 17th century the connection of Spain with the American fisheries appears to have ceased. Portuguese vessels also early visited the fishing grounds, the number employed in 1577 being estimated at 50, but the distant fishery was soon abandoned. Spain was noted from the 8th to the 16th century for the boldness of her fishermen engaged in the deep-sea fisheries, which were pursued chiefly from the Basque provinces. The shore fisheries still continue, and flourish mainly on the coasts of the bay of Biscay. In 1866 the number of vessels and boats registered for the fishery was 12,127, with an aggregate tonnage of 42,026; number engaged, 10,348; men, 39,440; fish caught, 148,795,295 lbs.; value, \$3,380,094: in 1867, registered, 12,596 vessels of 43,072 tons; engaged, 10,216; men, 37,558; fish caught, 106,609,767 lbs.; value, \$2,573,341.—The English visited Iceland for cod before 1415, and the fisheries at that island were prosecuted as late as 1580 or 1590. Sebastian Cabot, returning from his voyage of discovery in 1498, first called their attention to the American fisheries. The first voyages in quest of fish, however, of which we have any account, were in 1517. In 1522, 40 or 50 houses for the accommodation of fishermen were built in Newfoundland, though no permanent settlement was effected till about a century later. In 1548 and 1568 acts were passed to encourage the fisheries, and at the beginning of the 17th century it is estimated that 200 English vessels annually visited Newfoundland, employing in catching and curing the fish not fewer than 10,000 men and boys. In 1602 Bartholomew Gosnold explored the coast of New England, and, catch-

ing cod near the southern cape of Massachusetts, gave it the name it bears. Capt. John Smith followed in 1614, and caught a considerable quantity of fish on the coast of Maine. From this time the fisheries on the coast of New England began to be prosecuted with vigor. In 1616 full fares were taken by eight English ships. In 1620 the island of Monhegan off the coast of Maine had become a noted fishing station. In 1622 profitable fishing voyages to New England were made by 85 English ships, and the number employed at Newfoundland was 400, which, however, in a few years decreased to 150 sail, partly from the diminished consumption of fish in Europe owing to the growth of Protestantism, and partly from the increase of the coast fishery by the settlers on Newfoundland. Notwithstanding that measures were taken by the government to promote the fisheries, the number of fishing vessels continued to decline, till in 1670 only 80 were sent out. Several measures were accordingly adopted by the English government to prevent permanent settlement in Newfoundland, and consequent competition of boat fishermen from shore. These measures increased the number of fishing vessels, which in 1674 was 270, employing 10,800 men. Toward the end of the century settlers were again allowed to dwell in Newfoundland, but restrictions were imposed on the right to hold land. In 1701 the number of vessels employed was 121, with an aggregate tonnage of 7,991; number of boats, 993; fishermen, 2,727; cures (including women and children), 8,581; product, 216,320 quintals of fish and 3,798 hogsheads of oil. The boat fishery of the colonists again supplanted the fishery in vessels of large size, and to encourage the home merchants parliament in 1775 allowed a bounty of £40 to each of the first 25 ships, £20 to the next 100, and £10 to the second 100, that should make fares of fish before the middle of July and return to the fishing grounds for a second lading. In 1774 the whole number of British subjects employed in the Newfoundland fisheries was 28,652, and the product amounted to 789,877 quintals. The English fisheries were exceedingly prosperous between 1795 and 1815. In 1814, 1,200,000 quintals of fish were produced, worth \$12,000,000. After this period the fishery soon fell entirely into the hands of the colonists, and the distant fishery from England ceased.—The home fisheries of the British islands are of great extent and importance, the herring fishery of Scotland holding the first place. Cod, hake, and ling are also extensively taken in Scotland. Along the English coast are found cod, herring, mackerel, turbot, lobsters, oysters, &c., which are taken in large quantities fresh to the London market. The pilchard fishery is carried on along the shores of Cornwall and Devonshire, employing during the season from 2,500 to 3,000 fishermen, and producing an average of 25,000 hogsheads of pilchards annually. In Ireland the fisheries

have fallen off since the famine, the people being too poor to procure the necessary boats and outfits. In 1846 the number of vessels and boats engaged in fishing was 19,888, with 113,078 men; in 1856, 11,096, with 48,774 men; in 1866, 9,444, with 40,668 men; in 1868, 9,184, with 39,389 men; and in 1872, 7,914, with 31,811 men. In the last named year 1,118 of the vessels, with 5,488 men, were solely engaged in fishing; 685, with 3,126 men, principally; and 6,116, with 22,747 men, only partially. The number of those only partially engaged is probably too large by some 8,000, and they are for the most part employed only a few days in the year. The herring and mackerel fishery is perhaps the most important on the Irish coast, and is largely participated in by Cornish, Manx, and Scotch boats. The annual catch is valued at about £450,000. From Dublin to Waterford trawling is extensively carried on to supply the Dublin market. Herrings are caught here, and off Arklow and Wexford are the principal oyster banks. From Cork to Cape Clear the mackerel is chiefly taken, Kinsale being the headquarters of that fishery, while from Ardglass to Dublin is the principal herring fishery. The value of the oysters annually taken is about £50,000. The salmon fisheries of the rivers of Great Britain and Ireland are very productive; they are regulated by law, and are in general private property. The estimated value of the catch of England and Wales has increased within a few years from £20,000 or £30,000 to £100,000; the Irish yield is about £400,000 a year, and that of the Scotch salmon fisheries about £300,000. In 1869 there were 5,113 persons employed in the salmon fishery of England and Wales; in 1870, 4,593; in 1871, 5,437; in 1872, 5,217, of whom 2,907 were net fishermen and 2,310 anglers. The number of vessels fitted out for the fishery of cod, &c., in Scotland in 1872 was 155, of 6,400 tons and 1,624 men; for the herring fishery, 95 vessels, of 2,976 tons and 434 men. The number of decked and undecked boats engaged in the shore-curing fisheries was 15,232, with an aggregate tonnage of 106,464, employing 46,178 fishermen and boys, 868 curers, and 41,980 (estimated) other persons. The value of boats was £381,338; of nets, £521,327; of lines, £94,628; total value of equipments, £997,293. In 1869 there were registered at the several ports of the United Kingdom 42,960 fishing boats, with an aggregate tonnage of 242,179, giving employment to 152,779 men and 13,969 boys. Of these numbers 16,195 boats, with a tonnage of 127,013, employing 54,757 men and boys, belonged to England and Wales; 17,969 boats, 87,001 tons, and 78,179 men and boys, to Scotland; and 8,796 boats, 28,165 tons, and 88,812 men and boys, to Ireland. In 1872 the number registered was 40,546, with an aggregate tonnage of 261,761, viz.: England and Wales, 15,331 of 140,535 tons; Scotland, 16,765 of 92,595 tons; Ireland, 8,450 of 28,651 tons.

Of the whole number, 5,284 of 145,887 tons were of the first class (15 tons and over), 25,452 of 102,392 tons of the second class (under 15 tons, not navigated by oars alone), and 9,810 of 14,002 tons of the third class (navigated by oars only). Besides the above, there were 875 boats of 5,047 tons registered at the Isle of Man, and 802 of 2,988 tons at the Channel islands. The following table exhibits the quantity of white herrings (salted in barrels) and of cod, ling, and hake cured in Great Britain at various periods, the returns after 1851 being confined to Scotland and the Isle of Man, and after 1868 to Scotland:

YEARS.	Herrings, barrels.	Cod, Ling, and Hake.	
		Dried, cwt.	Pickled, barrels.
1811.....	91,827	.....	.....
1821.....	442,196	.....	.....
1831.....	439,870	37,674	2,950
1841.....	557,262	91,495	9,490
1851.....	544,009	90,859	5,082
1861.....	668,528	82,845	4,145
1866.....	658,147	115,619	9,957
1868.....	651,484	118,581	9,659
1870.....	889,160½	145,269	9,945
1871.....	825,476	118,080	9,338
1872.....	713,856½	145,976½	11,940½

The chief seats of the herring fishery are Stornoway in the Hebrides, Peterhead and Fraserburgh in Aberdeenshire, and Wick. More than half of the cod, &c., are caught at the Shetland islands, and considerable quantities are taken at the Orkney islands and from Stornoway. The trade of the United Kingdom in fish and the products thereof, from 1868 to 1872, is shown in the following tables:

IMPORTS.

YEARS.	Fish, cwt.	Value.	Fish oil, gallons.	Value.
1868.....	431,268	£440,553	8,525,732	£658,285
1869.....	629,449	681,109	8,845,528	861,788
1870.....	768,676	768,887	4,965,912	954,710
1871.....	605,880	711,295	6,219,108	1,087,734
1872.....	611,192	559,042	4,717,188	855,590

The fish oil is brought chiefly from British America and the United States; fresh fish from Holland and Norway; and cured or salted fish from British America, Norway, France, the United States, and Denmark.

EXPORTS.

YEARS.	DOMESTIC.			FOREIGN AND COLONIAL PRODUCE.	
	Herrings, barrels.	Value.	Other fish, value.	Fish, all kinds, cwt.	Value.
1868.....	426,656	£396,908	£223,850	23,264	£68,009
1869.....	492,718	692,806	254,959	26,559	65,344
1870.....	535,198	723,005	192,539	48,304	85,502
1871.....	659,954	838,446	379,993	55,949	111,788
1872.....	681,570	891,684	392,167	44,968	178,410

Included in the fourth column for 1871 are 7,752 cwt. of salmon, valued at £43,926; 28,871 of cod, &c., £38,490; 28,667 bushels

of oysters, £36,741; and 30,548 hogsheads of pilchards, £86,819. Of the herrings, 451,015 barrels were sent to Germany, and 72,162 to Italy. The other fish is exported chiefly to France, Italy (which receives nearly all the pilchards), Belgium, Spain, and the Canaries. In 1871, 447,300 gallons of oil, valued at £57,514, the produce of foreign and colonial fisheries, were exported.—In Italy, in 1869, 29,385 men (including about 4,000 engaged in the coral fishery) were returned as employed in fishing; in 1870, 30,848; but these numbers are believed to be below the truth. In the former year 8,346 men were engaged in the sea fishery, and the rest in the coast fishery. In fishing proper there were 11,219 boats of 37,738 tons, of which 9,817 of 25,414 tons were employed along the coast, 670 of 5,556 tons at sea, and 732 of 6,768 tons in foreign waters; in 1870 the number of boats was 11,129, with an aggregate tonnage of 38,554. The foreign waters visited are chiefly those of the Austrian coast (Istria and Dalmatia); a smaller number of vessels frequent the coasts of Corsica and Provence in France, and the rest are employed in the Grecian seas and along the shores of Algeria, Tunis, and Egypt. The richest Italian fisheries are in the Adriatic, especially near Chioggia and Venice, while the sea near Liguria is the least productive. The principal kinds taken are sardines and anchovies, particularly in the Mediterranean, sword fish in the seas of Sicily, especially near Catania, and cuttle fish near the Adriatic coast of S. Italy. The tunny fishery, however, is the most important. It is carried on, chiefly in Sardinia and Sicily, by means of large fixed nets or weirs, called *tonnare*, of which there are 48. In Sicily the average catch is 15,000 tunnies, worth about \$400,000; the average product of Sardinia is 25,000 tunnies, of a somewhat smaller size than those of Sicily, besides a considerable quantity sold in boxes, of which the exact value is not known. About 2,500 persons are employed in catching and preparing them for market. The artificial preserves of the Venetian territory, known as *valli da pesca*, those at Comacchio and elsewhere in the province of Ferrara, and various salt lakes or marshes of Sardinia and the Neapolitan territory, where the fish are carefully fattened, yield an important product. There are 173 of these preserves on the Venetian coast, of which 68 are in the lagoon of Venice. They give employment to about 1,000 men, nearly all of whom belong to Chioggia, and produce annually nearly 6,000,000 lbs. of choice fish (eels, mullets, gold fish, &c.), worth about \$325,000. Those of Comacchio produce an average of 2,650,000 lbs. annually, of which about 1,800,000, chiefly eels, are carefully prepared in that city, and exported to various parts of Italy, and to some extent to Germany and Austria, producing a revenue of about \$150,000. The other important preserves of Ferrara are those of Mesola, which produce about 650,000 lbs. yearly, and those at the

mouths of the Po. The principal Neapolitan lakes are Varano, which gives employment to 200 fishermen, and produces 5,500,000 lbs. of fish a year, and Lesina, Salso, and Salpi, which together employ 52 fishermen and produce 581,300 lbs.; others, whose exact product is unknown, employ 500 fishermen. The productive lakes and marshes of Sardinia are mostly in the S. and W. parts. The fish is consumed in the country, except a preparation of the roes of the mullet, which is sold to a considerable extent on the continent. Shell fish are cultivated in the gulf of Taranto, and oysters, mussels, &c., are shipped by rail to Naples and more distant points. At least 10,000 persons, including fishermen and workmen with their families, derive support from this source. The returns of the fisheries in the rivers and internal lakes of Italy are incomplete, but the principal ones employ 1,844 boats and 3,202 men, yielding about 2,500,000 lbs. of fish annually. The imports of fish for consumption in 1869 amounted to 564,000 cwt., valued at \$3,500,000, of which 1,625 cwt. was the product of the national fishery, being a portion of the catch in foreign waters, the rest being sold directly to foreigners. Of the foreign imports 42,250 cwt. consisted of sardines, anchovies, &c. The exports were 36,900 cwt., valued at \$279,500, of which 15,580 cwt. were the product of the national fishery and 21,320 cwt. of foreign fisheries. The foreign exports are chiefly from Austria, imported under a light duty and reexported to South America and other countries. The imports in 1870 were 622,000 cwt., valued at \$4,245,000; exports, 31,100 cwt., valued at \$256,000. In Austria in 1867 there were 1,082 boats engaged in fishing, having an aggregate tonnage of 3,001, and employing 3,643 men.—Tunis has an important tunny fishery at Sidi Daud, 10 m. W. of Cape Bon. The season commences in April and ends about the middle of July, during which time about 200 men are employed. The tunny is either boiled and packed in olive oil, when it is known as *scabeccio*, or preserved in salt. The oil extracted from the heads, bones, and other refuse is much used by tanners and curriers. From 10,000 to 14,000 tunnies are taken in a good season. In 1871 the yield of *scabeccio* was 3,200 barrels and about 200,000 lbs. in tin cans, of salted tunny 8,000 barrels, and of oil 65,460 gallons, the whole being worth about \$150,000. The demand for this fish is limited to the countries bordering on the Mediterranean, the product of the Tunisian fishery being taken mostly to Italy and Malta. The *tonnare* of Ras Zibib and Ghademse island are no longer in operation. Tunis also produces 5,000 or 6,000 cwt. of dried polyps or octopods, a name under which certain species of cephalopods are known in the Levant and Greek markets, where they are imported for use in Lent, not being included by the eastern church in the prohibition against fish during seasons of religious ab-

stinence. They are mostly taken first to Malta. The chief fishery is at the Kerkena islands. Portugal competes with Tunis for the possession of the Greek market. The lakes near the city of Tunis, especially Bizerta, containing various species, the most important of which are the gray mullet and the bream, supply the home market with fresh fish. The roes of the mullet, prepared as *buttarga*, and exported principally to Italy, are the chief source of revenue.—The Norwegian fisheries, extending along the entire W. and N. coasts of that country, including the adjacent islands, are the most productive in Europe. During the months of January, February, and March, the cod and herring visit in immense numbers the fiords which indent these shores. There is also a summer fishery for herring, when the best quality of fish is taken. The average annual product of herring is 1,000,000 barrels. The rivers abound in salmon, and large numbers of lobsters are sent to the London market. The exports of salmon and other fresh fish in 1871 amounted to about 76,000 cwt., of which 2,000 cwt. were salmon, and 70,000 cwt. mackerel. In that year 24 vessels, with a tonnage of 1,082 and 248 men, were fitted out for the walrus or sea-horse fishery at Nova Zembla and Spitzbergen, which brought in a catch valued at about \$27,000; the shark fishery employed 28 vessels, with a tonnage of 895 and 173 men, and the product was of about the same value. In 1860, 276 vessels, 2,682 boats, and 13,786 men were engaged in the herring fishery, and 5,675 boats and 24,266 men in the cod fishery. In 1868 the exports of fishery products amounted to about \$3,000,000; in 1869, \$9,600,000; in 1870, \$10,900,000, of which over \$6,000,000 were the value of cod-fishery products, and over \$4,500,000 of the herring fishery. The actual gain to the fishermen employed in 1868 was \$4,760,000; in 1869, \$4,600,000; in 1870, \$4,980,000; in 1871, \$5,580,000, of which \$3,420,000 represent the cod fishery, \$1,840,000 the herring fishery, and \$270,000 the other fisheries. The chief markets are Spain, Prussia, Sweden, Russia, and Holland, which receives the greater part of the cod-liver oil.—In Denmark, fishing is pursued to a considerable extent along the coasts. The cod is the principal fish, though flounders and herrings are also taken, and in smaller quantities salmon, porpoises, and oysters. In 1865, 387 vessels, with a tonnage of 5,380 and about 4,000 men, were employed. The principal fisheries, however, are at the dependencies of Greenland, the Faroe islands, and Iceland. Whale and seal oil is the chief item at Greenland, and codfish at the other points. Iceland in 1858 employed in the fisheries 25 decked boats and 3,481 open boats, with about 7,000 men; in 1870, 68 large decked boats and 3,092 open boats, with from 2 to 12 oars each. The large boats are employed generally in the shark fishery, which is carried on mostly on the N. side

of the island; the smaller boats in the cod and herring fishery, though the latter is little pursued. Salmon are found in the rivers near Reykiavik and at the north of the island, and small quantities are exported. The exports of fishery products in 1864 were 64,352 quintals of fish and 8,962 barrels of roe and oil; in 1865, 29,807 quintals and 9,972 barrels; in 1866, 39,850 quintals and 9,722 barrels; in 1867, 83,619 quintals and 15,045 barrels; in 1868, 41,824 quintals and 9,335 barrels; in 1869, 56,865 quintals and 8,721 barrels. The exports of an average year are 50,789 quintals of salt fish, 2,186 of dried fish, 1,188 barrels of salt roe, and 9,105 of liver oil (chiefly shark), valued at \$290,108. The total imports into Denmark in 1870 were: salt herrings, 11,829,126 lbs.; other fish, 3,427,128 lbs.; in 1871, herrings, 19,104,788 lbs.; other fish, 5,494,110 lbs. The exports in 1870 were: fresh fish, 2,090,709 lbs.; herrings, &c., salted, 5,928,580 lbs.; in 1871, fresh fish, 2,188,165 lbs.; herrings, &c., 13,553,236 lbs.—Among other European nations, the Dutch for several centuries took the lead in the fisheries, and the herring fishery was long a chief source of their wealth. It has, however, much declined. In 1867 Holland employed in the deep-sea fisheries 89 vessels, with an aggregate tonnage of 27,650; number of men in vessels and boats, 11,880. The value of the catch in 1866 was: herrings, \$665,668; cod, ling, whiting, &c., \$2,328,920; anchovies, \$600,500; total, \$3,595,088. The imports in 1871 were 14,090 tons of salt herring and 50,600 quintals of cod; exports, 67,110 tons of salt herring, 84,241,000 smoked herrings, 23,680 quintals of salt cod, 80,600 of dried cod, and 6,850,800 lbs. of fresh sea fish. The number of fishing boats employed in Belgium in 1871 was 263 of 8,968 tons, employing 1,628 men; the value of imports for consumption was \$1,472,600. The annual value of the catch is about \$500,000, of which about \$200,000 are the product of the cod fishery.—The principal maritime fisheries of Russia in Europe are: the Caspian sea, which produces immense quantities of sturgeon, seals, &c.; the Black sea and sea of Azov, yielding the herring, tunny, salmon, sea trout, and anchovies; and the Baltic, furnishing cod, halibut, salmon, lampreys, &c. The White sea, abounding in herring, cod, and halibut, furnishes almost the sole support of the inhabitants along its coast. The river fisheries are important, the Volga being the most productive, abounding in sturgeon, and supplying large quantities of caviar. Lakes Ladoga, Onega, and Ilmen, and White lake, contain valuable fisheries. The product of all these sources has been estimated at \$11,500,000, of which about one half is the value of the sea fisheries. The coasts of Asiatic Russia swarm with fish, but the fisheries are undeveloped.—The waters of China abound in fish, and it is estimated that one tenth of the people of that empire derive their food from the water. The coasts

are crowded with enterprising and industrious fishermen, and besides the net and the hook, a great variety of expedients are resorted to. In the eastern provinces cormorants are trained to catch fish, which they bring to their master, who from his boat oversees 12 or 15 birds at the same time.—The great sea fisheries of the United States are mostly carried on from New England. They date from the earliest settlement of the country, it being probable that among the motives that led to the colonization of Massachusetts was the hope of profit from the fisheries on the coast, which Smith, Archer, Brereton, and other writers of the day represented as surpassing even those of Newfoundland. Very soon after their arrival at Plymouth the pilgrims engaged in the fisheries. In 1624 they sent to England a ship laden with fish, and in the next year two others with fish and furs. In 1628 they were selling fish to the Dutch at New Amsterdam. About 1670 the profits of the mackerel, bass, and herring fisheries at Cape Cod, which appear to have been considered public property, and to have been leased for the general benefit, were granted to found a free school, which was opened in 1671. From Boston fish began to be exported as early as 1633. In 1689 the general court of Massachusetts passed an act to encourage the fisheries, which exempted fishing vessels and all property connected with them from taxes and duties for seven years, and relieved fishermen during the fishing season and ship builders from military duty. At the close of the 17th century the merchants of Massachusetts exported annually about 100,000 quintals of codfish, worth \$400,000, to Portugal, Spain, and Italy. In 1731 the fisheries of the colony employed 5,000 or 6,000 men. Ten years later the number of fishing vessels belonging to Massachusetts was 400, besides as many shallops and undecked boats. The annual produce of the cod fishery was about 280,000 quintals, of which \$700,000 worth was exported. At the outbreak of the revolutionary contest the fishing towns were rich and populous. Marblehead was second only to Boston in population and property. In 1775, in the hope of starving New England into submission, the British parliament passed an act to deprive the colonies of the right of fishing on the banks of Newfoundland. The breaking out of hostilities which soon followed nearly destroyed the fisheries for a time, and the fishermen of New England turned their attention principally to privateering, though many enlisted in the army. In the negotiation of the treaty of peace in 1783, the right of the Americans to a share in the fisheries was secured by the firmness of John Adams, it being agreed "that the people of the United States shall continue to enjoy unmolested the right to take fish of every kind on the Grand bank, and on all the other banks of Newfoundland; also in the gulf of St. Lawrence, and at all other places in the sea where the inhabitants of both coun-

tries used at any time heretofore to fish; and also, that the inhabitants of the United States shall have liberty to take fish of every kind on such part of the coast of Newfoundland as British fishermen shall use, and also on the coasts, bays, and creeks of all other of his Britannic majesty's dominions in America." The British government, however, to check the growth of the fisheries of the United States, and to encourage those of the colonies, by an order in council of July, 1783, prohibited the importation of American fish into the British West Indies, which had been one of the best markets for the New England trade. The federal government early recognized the importance of the fisheries, and from time to time granted bounties for their encouragement, and imposed protective duties upon the importation of foreign-caught fish. The first act was passed in 1789, which granted a bounty of 5 cents per quintal on dried and 5 cents per barrel on pickled fish exported, in lieu of a drawback of the duties on imported salt used in the cure, and imposed a duty of 50 cents per quintal on imported fish. In 1790 the bounties were doubled. By the act of Feb. 16, 1792, the bounty on dried fish was discontinued, and a specific allowance was made to vessels employed exclusively in the cod fishery at sea for four months between the last day of February and the last day of November: to vessels of between 20 and 30 tons, \$1 50 per ton annually; and to those of more than 30 tons, \$2 50 per ton; but the annual allowance to any vessel was limited to \$170. Three eighths of the bounty was given to the owners, and the remaining five eighths was to be divided among the fishermen. To boats of between 5 and 20 tons, \$1 per ton, to be divided among the fishermen, was allowed annually, provided they had brought in 12 quintals of cured fish per ton during the season. The act of May 2, 1792, fixed the allowance on pickled fish at 8 cents a barrel, and increased the bounties on vessels 20 per cent., after Jan. 1, 1793. In 1797 an act was passed, which increased the bounty on pickled fish to 12 cents a barrel, and further raised the allowances to vessels 33½ per cent., after Jan. 1, 1798. An act of 1799 increased the bounty on pickled fish to 30 cents a barrel. In 1807 all bounties were abolished. The act of 1813, similar in its provisions to those mentioned above, revived the bounty, and fixed the allowance to vessels of from 5 to 20 tons at \$1 60 per ton; to those of from 20 to 30 tons, at \$2 40; to those of more than 30 tons, at \$4; and on pickled fish, at 20 cents a barrel; but no vessel was to receive over \$272. The law was modified in 1819, and allowances were granted to vessels of from 5 to 30 tons of \$3 50 per ton; to those of more than 30 tons, \$4 per ton, and if having a crew of 10 men, and employed 3½ months but less than 4 months, \$3 50 per ton; no vessel to receive more than \$360. In 1846 the bounty on pickled fish was discontinued, and a drawback of the duties on

imported salt used in the cure was substituted. The bounties to vessels were abolished by the act of July 28, 1866, but the duties on foreign salt used in curing fish were remitted. An act of 1817 required the master and three fourths of the crew to be citizens of the United States, to entitle the vessel to bounty; but this act was repealed, except as to the master, in 1864. By an act of 1789, vessels of 20 tons and upward destined for the fishery were required to be enrolled, and they as well as registered vessels might be licensed for one year, which exempted them from the necessity of entering and clearing during that period. Vessels of from 5 to 20 tons were required to be licensed. The act of 1793 required vessels of 20 tons and upward to be enrolled and licensed, and those of less than 20 tons to be licensed. In 1828 an act was passed requiring a special license for vessels employed in the mackerel fishery; and in 1836 such vessels were given the privilege of engaging in the cod or other fishery, but they were not entitled to the bounty. During the war with England in 1812-'15 the British cruisers kept the fishermen from the distant fishing grounds. Many of them entered the navy, and the frigate *Constitution* was chiefly manned by them, while great numbers engaged in privateering. In the negotiations for peace the British endeavored in vain to procure from the United States a relinquishment of their right to the fishing grounds, and maintained, after peace was concluded, that the state of hostilities had abrogated the concession of rights made in 1788. Discussions ensued between the two governments, which resulted in 1818 in a convention, by which it was agreed that the Americans should have the liberty of taking fish on the S. coast of Newfoundland between Cape Ray and the Rambeau islands; from Cape Ray to the Quirpon islands; on the shores of the Magdalen islands; and also on the S. coast of Labrador from Mount Joly to and through the strait of Belle Isle, and thence northward indefinitely along the coast. The United States on their part renounced formally the right of fishing on or within three marine miles of the British dominions in America not included in the above specified limits. In the summer of 1852 serious troubles broke out between the American fishermen and the British authorities, who claimed the right to exclude the former from the bays and inlets of the British possessions. The dispute was temporarily settled by mutual concessions, and in 1854 a reciprocity treaty was agreed upon by the two countries, containing the following stipulations concerning the fisheries, in addition to those contained in the convention of 1818: "The inhabitants of the United States shall have, in common with the subjects of her Britannic majesty, the liberty to take fish of every kind except shell fish on the sea coasts and shores, and in the bays, harbors, and creeks of Canada, New Brunswick, Nova Scotia, Prince Edward island, and of the

several islands thereunto adjacent, without being restricted to any distance from the shore, with permission to land upon the coasts and shores of those colonies, and the islands thereof, and also upon the Magdalen islands, for the purpose of drying their nets and curing their fish." It was specified that the liberty thus granted should apply solely to sea fisheries, and not to salmon, shad, or other river fisheries; and that the fishermen should not interfere with the rights of private property, or trespass on parts of the shore occupied by British fishermen. Similar rights, with similar reservations, were granted to British fishermen on the E. coast of the United States N. of lat. 36°. This treaty was terminated March 17, 1866, by virtue of notice given by the United States, March 17, 1865, pursuant to one of its provisions. In 1870 difficulties again arose between the United States and Great Britain respecting the fisheries, in consequence of certain unfriendly acts of the provincial authorities, and in 1871 the stipulations of the treaty of 1854 given above were revived by the treaty of Washington, which also provided that "fish oil and fish of all kinds, except fish of the inland lakes and of the rivers falling into them, and except fish preserved in oil, being the produce of the fisheries of the United States, or of the Dominion of Canada, or of Prince Edward island, shall be admitted into each country, respectively, free of duty." The rights of British subjects on the coast of the United States were, however, restricted to that portion N. of the 89th parallel. The necessary laws having been passed by the several countries, these provisions went into operation July 1, 1873, to remain in force for the period of ten years thereafter, and further until the expiration of two years after the United States or Great Britain shall have given notice to terminate them. It was provided that, with the consent of the United States and Great Britain, these stipulations might extend to Newfoundland, and a colonial act was passed March 28, 1874, to carry them into effect.—Mackerel were early caught by the New England colonists, and the fishery soon assumed considerable importance. They were probably at first taken in seines, nets, and boats from the shore, but before the revolution fleets of sloops were engaged in the fishery, and in 1770 not fewer than 100 vessels were employed in Massachusetts. The use of vessels appears subsequently to have declined, and to have been revived about the beginning of the present century. Mackerel are caught on the coast of New England and as far S. as the entrance of Chesapeake bay, but the most productive fisheries are in the bay of Chaleurs and the gulf of St. Lawrence. From 1765 to 1775 Massachusetts employed annually in the cod fishery an average of 665 vessels, having an aggregate tonnage of 25,630, and manned by 4,405 men, and exported 178,800 quintals of fish to Europe and 172,500 quintals to the West Indies. From 1786

to 1790 the number of vessels was 539 of 19,185 tons, employing 3,278 men, and the exports were 108,600 quintals to Europe and 142,050 quintals to the West Indies. Herring are taken to some extent in the rivers and bays from North Carolina northward, though the erection of mills and dams has driven them from many localities which they formerly frequented. American vessels, chiefly from Gloucester, Mass., the great fishing port of the country, visit New Brunswick, Newfoundland, the Magdalen islands, and Labrador for that fish, while the halibut fishery is pursued to some extent from that port on George's and the western banks and at Greenland. Extensive menhaden fisheries have sprung up within the last 15 years on Long Island, and at other points along the coast from New Jersey to Maine. The oil obtained from this fish is much used by leather dressers, and the scrap or refuse is a valuable ingredient in the manufacture of fertilizers for the exhausted cotton lands of the south. It is estimated that in 1873 2,000,000 gallons of oil, valued at \$900,000, and 40,000 tons of scrap, worth \$640,000, were produced. Oysters are found particularly in Chesapeake and Delaware bays, from which they are brought in large quantities and planted in the vicinity of New York city, where they acquire a peculiar flavor. Turtle are abundant in the waters surrounding the Florida keys, and the catch is of considerable value. Besides the sea fisheries, the river and lake fisheries of the United States are of great importance. There are valuable shad fisheries in the Connecticut, Hudson, Delaware, Potomac, and other rivers falling into the Atlantic. The great lake fisheries are those of Erie, Huron, Michigan, and Superior. The whitefish is the principal object of pursuit, though trout, pickerel, and lake herring are caught in large quantities. The waters of the Pacific, N. of California, abound in valuable fish, the fisheries of Alaska being of vast extent and great productiveness. Cod is the chief object of pursuit, but halibut and herring are also numerous. In 1864, 1 vessel was fitted out from San Francisco for the northern cod fishery; in 1865, 7; in 1866, 18; in 1867, 28; in 1868, 19; in 1869, 27; in 1870, 33. They frequent mainly the banks in the vicinity of Kadiak and the Shumagin and Fox islands, though the Okhotsk sea is occasionally visited. From 1864, when the business commenced, to 1870, 276,414 quintals of fish, valued at \$2,457,414, were caught; the product of 1870 was 94,750 quintals, worth \$754,840. The fishery is pursued during the summer. Several species of salmon, including the king salmon (*onchorhynchus orientalis*), which frequently weighs from 60 to 90 lbs., swarm in the Yukon and other Alaskan rivers. The salmon fisheries of the Columbia river are of great value. In 1872 the number of fish preserved was 332,000, weighing 5,800,000 lbs., and worth \$359,000, of which 2,700,000 lbs. were canned, and 2,600,000 lbs. pickled. The following table

exhibits the tonnage employed in the fisheries in the United States at various periods since 1790, the cod and mackerel fisheries prior to 1831 and since 1867 not being separated:

YEARS.	TONNAGE.		
	Cod fishery.	Mackerel fishery.	Total.
1791	.....	.....	82,542
1801	.....	.....	89,832
1811	.....	.....	43,234
1821	.....	.....	62,398
1831	60,978	46,211	107,189
1841	64,522	11,891	77,573
1851	95,617	50,589	146,156
1861	137,666	54,795	192,461
1862	123,601	80,596	204,197
1863	117,290	61,019	178,309
1864	108,742	53,499	162,241
1865	65,155	41,909	107,064
1866	51,642	46,759	98,401
1867	44,507	31,498	76,005
1868	.....	.....	68,887
1869	.....	.....	62,104
1870	.....	.....	91,480
1871	.....	.....	92,596
1872	.....	.....	97,547
1873	.....	.....	109,518

From 1850 to 1862 the number of vessels ranged from 2,414 to 3,815 (in the latter year); in 1868 the number was 2,220; in 1869, 1,714; in 1870, 2,292; in 1871, 2,426; in 1872, 2,885. In the last mentioned year 1,486 vessels of 87,408 tons were above 20 tons each, and 899 with a tonnage of 10,144 under 20 tons each; 666 vessels, with an aggregate tonnage of 18,790, belonged to Maine; 45, of 8,419 tons, to New Hampshire; 1,301, of 68,263 tons, to Massachusetts; 76, of 868 tons, to Rhode Island; 169, of 4,892 tons, to Connecticut; and 128, of 1,815 tons, to New York. In 1873 the number of vessels was 2,458, and the tonnage was distributed as follows: Massachusetts, 54,188; Maine, 46,196; Connecticut, 4,193; New York, 1,771; California, 1,177; Rhode Island, 1,071; New Hampshire, 922. There were 187 vessels of 44,755 tons engaged in the whale fishery. Of the number of fishing boats employed from the shore there are no accurate statistics. The number of seamen employed in the cod and mackerel fisheries in 1859 was 21,758; in 1862, 28,048; in 1864, 21,925; in 1868, 28,250. The tables of occupations in the census of 1870 include 27,106 fishermen and oystermen, but the returns are admitted to be imperfect, large numbers of persons engaged wholly or partially in fishing being returned as sailors, agriculturists, &c. The value in round numbers of the products of the national fisheries of all kinds, as returned in the censuses, was \$12,000,000 in 1840, and \$10,000,000 in 1850. The tables of fisheries in 1860 include 422 establishments in the whale fishery, having a capital of \$13,292,060; value of materials used, \$2,789,060; number of hands employed, 12,301; wages paid, \$3,509,080; value of product, \$7,749,305; oyster fishery, 427 establishments, \$498,252 capital, \$452,250 materials, 2,271 hands, \$446,656 wages, and \$1,410,497

product; other fisheries, 1,121 establishments, \$4,129,447 capital, \$1,060,910 materials, 18,811 hands, \$2,121,841 wages, and \$5,124,608 product; total, 1,970 establishments, \$17,919,759 capital, \$4,302,355 materials, 30,888 hands, \$6,077,577 wages, and \$14,284,405 product. The value of products in 1866 was \$12,500,000. The fishery table in 1870, which does not include the whale fishery, returns 2,140 establishments, employing 20,504 hands; capital, \$7,469,575; wages paid, \$3,449,881; value of materials used, \$1,642,276; of products, \$11,096,522. The chief producing states were: Massachusetts, \$6,215,325; Maine, \$979,610; Connecticut, \$769,799; Michigan, \$567,576; Ohio, \$383,121; New Jersey, \$374,912; Washington territory, \$289,746; North Carolina, \$265,839; New York, \$285,750; Wisconsin,

\$214,190; California, \$150,260; Rhode Island, \$124,505; Florida, \$101,528. The principal items were 559,982 quintals of cod, 2,451 tons of halibut, 31,210 barrels of herring, 221,003 of mackerel, 69,561 barrels and 25,700 thousand whitefish, 647,812 bushels of oysters, 2,617,000 shad, 24,118 barrels of salmon, and 1,810,000 lbs. of canned salmon. The following table shows the value of the products of the national fisheries since 1858, brought in by vessels making entry at the custom house, but does not include the product of the shore fisheries, nor fish brought in by coasters and fishing smacks, except so far as unofficial information has been obtained, which in recent years has been much fuller than formerly, through the efforts of the bureau of statistics to obtain a complete statement:

YEARS.	Spermaceti, whale, and other fish oil.	Other products of the fisheries.	Total.	YEARS.
1858.....	\$199,258	\$187,654	\$386,912	1866.....
1859.....	591,901	129,817	721,718	1867.....
1860.....	649,077	112,040	761,117	1868.....
1861.....	845,449	74,695	920,144	1869.....
1862.....	588,829	352,087	940,916	1870.....
1863.....	484,521	160,708	645,229	1871.....
1864.....	1,459,018	699,088	2,158,106	1872.....
1865.....	1,071,334	562,065	1,633,399	1873.....

The principal items in 1872, not including the whale fishery, were 733,487 quintals of cod-fish, valued at \$3,194,286; 430,408 of mackerel, \$2,456,009; 159,923 of herring, \$340,963; 178,539 of other cured fish, \$657,615; 693,700 bushels of oysters, \$238,080; 45,077,278 lbs. of fresh fish (other than shell fish), \$1,106,500; 1,437,843 gallons of oil, \$508,402; 10,757 skins, \$117,411; value of shell fish (other than oysters), \$591,324; of other fishery products, \$316,057. The quantity of salt withdrawn from warehouse for curing fish in 1871, under the act of 1866, was 64,671,139 lbs., valued at \$66,007; in 1872, 57,830,929 lbs., worth \$60,155. The table below includes the quantities of dried or smoked and of pickled fish exported, with the quantities of mackerel inspected, at various periods since 1790:

EXPORTS.

YEARS.	DRIED OR SMOKED FISH.		PICKLED FISH.			Mackerel inspected, barrels.
	Quintals.	Value.	Barrels.	Eggs.	Value.	
1791....	363,287	.....	57,426	.....	.....	.....
1801....	410,948	.....	35,585	10,424	.....	8,079†
1811....	214,267	\$757,000	44,716	9,393	\$305,000	17,000‡
1821....	267,305	708,778	76,439	4,169	264,000	111,009
1831....	290,577	625,898	91,787	8,594	304,441	405,009
1841....	252,199	602,810	86,506	8,949	148,978	56,637
1851....	151,068	367,739	21,214	3,215	113,992	368,787
1861....	219,224	624,941	46,252	3,669	244,028	194,234§
1871....	119,618	592,563	29,606	.....	226,869	259,417
1872....	126,613	603,194	30,643	...	202,077	181,267§

* Spermaceti, whale, and other fish oil.

† Other products of the fisheries.

‡ In 1804. § In Massachusetts.

In 1871 the total value of exports of the products of the national fisheries was \$2,612,890; of foreign fisheries, \$376,018; in 1872, domestic exports, \$2,913,897, including oysters to the value of \$243,723, and whale and other fish oil to the value of \$1,250,074; foreign exports, \$544,680. The principal points of shipment are Great Britain, Hayti and Santo Domingo, France, Cuba, Porto Rico, the French and Dutch possessions in America, and the British West Indies. The imports of foreign fish and products thereof in 1871 amounted to \$3,081,518; in 1872 to \$3,191,506, including 8,636,279 lbs. of fresh fish for daily consumption, imported free of duty, valued at \$278,921; 223,612 gallons of whale and other fish oil, \$106,249; 68,692 barrels of herring, \$359,262; 90,889 of mackerel, \$610,457; and sardines and anchovies to the value of \$1,172,704. With the exception of the sardines, which were brought from France and Great Britain, and some herrings imported from Germany, the imports were almost exclusively from British America. —The British American colonies are the seat of fisheries among the richest in the world, which have been pursued since the first settlement of those countries. Their early history is referred to above. In 1832 Nova Scotia employed 570 vessels and shallops and 640 boats, and exported 160,640 quintals of dried, 37,154 barrels of pickled, and 8,641 boxes of smoked fish, valued at \$509,820; in 1843, 240 vessels, 3,400 boats, and 10,000 men. In 1851 the number of vessels was 812; of boats, 5,161; nets and seines, 30,154; men, 10,894; exports, 196,484 quintals of dried, 268,843 barrels of

pickled, and 15,409 boxes of smoked fish, valued at \$941,896. These figures are exclusive of Cape Breton, the product of which in 1847 was valued at \$802,616. In 1869 the number of vessels was 635, with an aggregate tonnage of 21,656, besides 819 sail boats, 8,793 skiffs, &c., and 3,558 whale boats. The exports of New Brunswick in 1829 were valued at \$137,930; in 1838, \$200,405; in 1848, \$126,180. The value of the fisheries of Nova Scotia in 1860 was \$2,562,000; New Brunswick, \$388,885; Canada, \$700,000; total, \$3,650,885. The products of the Dominion of Canada in 1869 amounted to \$4,584,151 66; in 1870, to \$7,677,891 72. For the year ending June 30, 1871, the products were valued at \$7,678,200, viz.: Ontario, \$193,524; Quebec, \$1,198,612; New Brunswick, \$1,185,038; Nova Scotia, \$5,101,081; (Cape Breton, \$1,283,050). The number of fishermen was 33,029, viz.: Ontario, 1,959; Quebec, 5,596; New Brunswick, 5,161; Nova Scotia, 20,318; (Cape Breton, 5,780). Quebec also returned 88 vessels, 2,651 fishing boats, 1,664 flatboats, 359 sailors, and 2,568 shoremen, as employed in the fisheries. The principal items of the catch were 670,487 cwt. of cod, 144,572 of scale fish (haddock, hake, and pollock), 13,600 of halibut, 240,905 barrels of mackerel, 385,700 of herring, 35,225 of alewives, 15,863 of shad, 60,050 of mixed fish, 13,317 of whitefish, 7,477 of trout, 7,613 of salmon, 2,017,484 lbs. of fresh salmon, 101,581 salmon in cans, 614,232 gallons of oil (mostly cod), 1,130,000 cans of lobsters, and 39,450 bushels of oysters. The value of the fisheries for the year ending June 30, 1872, was \$9,570,116, viz.: Ontario, \$267,833; Quebec, \$1,820,189; New Brunswick, \$1,965,459; Nova Scotia, \$6,016,835. The principal items for Ontario were 17,940 barrels of whitefish, 7,586 of trout, and 6,974 of herrings; Quebec, 217,741 cwt. of cod, 29,047 barrels of herrings, and 186,529 gallons of cod oil; New Brunswick, 626 barrels and 1,474,777 lbs. of salmon, 2,049 barrels and 33,680 cans of mackerel, 89,898 barrels and 572,143 boxes (smoked) of herrings, 22,996 barrels of alewives, 6,949 of cod tongues and sounds, 3,071 of shad, 7,944 of eels, 24,620 of oysters, 81,421 quintals of cod, 19,931 of pollock, 87,442 of hake, 1,190 of haddock, 1,055,485 cans of lobsters, and 81,715 gallons of oil; Nova Scotia, 3,529 barrels and 629,525 lbs. of salmon, 115,681 barrels and 50,500 cans of mackerel, 168,513 barrels and 34,302 boxes (smoked) of herrings, 11,712 barrels of alewives, 4,643 of halibut, 8,867 of shad, 525,249 quintals of cod, 24,099 of pollock, 89,214 of hake, 2,422,058 cans of lobsters, and 414,419 gallons of oil. The rivers of British Columbia swarm with salmon, and the waters of the coast abound in cod, herring, halibut, &c.; but the fishery is undeveloped. Whitefish, trout, &c., are found extensively in Manitoba and the N. W. territory, particularly in the waters that empty into Hudson bay. The imports of fish and the products thereof into the Dominion for

the year ending June 30, 1872, amounted to \$1,083,686, of which \$41,618 were brought into Ontario, \$381,982 into Quebec, \$30,601 into New Brunswick, \$619,248 into Nova Scotia, and \$10,098 into British Columbia. Of the whole amount, \$919,340 worth came from Newfoundland and Prince Edward island. The exports amounted to \$4,328,832, viz.: \$59,856 from Ontario, \$758,890 from Quebec, \$271,059 from New Brunswick, \$3,200,821 from Nova Scotia, and \$37,706 from British Columbia. The principal points to which the exports were taken are the West Indies, the United States, South America, Great Britain, Italy, and Portugal. The value of fish caught in Prince Edward island in 1860 was \$272,582; in 1869, \$169,580, of which \$110,670 were mackerel, \$19,017 herring, and \$39,893 cod and scale fish. The product of the Newfoundland fisheries in 1860 has been stated at \$4,440,000. The principal items of export since 1868 have been as follows:

YEARS.	Cod, quintals.	Herring, barrels.	Cod oil, gallons.	Seal oil, gallons.	Seal skins, number.
1868	1,160,948	186,168	880,592	1,268,460	338,306
1869	1,206,441	179,440	1,224,468	1,406,160	368,021
1870	1,215,644	146,709	1,071,766	1,604,988	355,428
1871	1,329,366	187,439	1,893,853	2,143,009	587,094
1872	1,222,248	147,771	1,097,208	1,066,456	278,879

In 1872 there were also exported 5,049 tierces of salmon, 2,189 barrels of trout, 1,519 of other fish, 441 cwt. of halibut and haddock, 124 packages of tongues and sounds, 9,567 gallons of whale oil, 14,616 of other oil, and 26,208 of blubber. Of the cod in the above table, 303,404 quintals were exported from Labrador, and of the herring 58,760 barrels. The total value of the exports from Newfoundland in 1869 was a little less than £1,800,000; the chief markets are Spain, Portugal, Brazil, Great Britain, and the British West Indies. The population of the colony in 1869 was 146,586, of whom nine tenths are directly or indirectly engaged in the fisheries. The number of fishermen in 1873 was 32,000. The total annual value of the fisheries on the banks and off the coasts of the British North American provinces was estimated in 1869 by the United States consul at Halifax at nearly \$23,000,000, viz.: provincial fisheries, nearly \$12,000,000; United States, \$7,000,000; French, \$4,000,000.—The most comprehensive account of the fisheries of the world and of their commercial value is contained in a report of Col. Richard D. Cutts of Washington to the secretary of state on "The Commerce in the Products of the Sea," made in 1869, and printed by order of the senate as executive document No. 84 of the 2d session of the 42d congress. The statistics are for 1865. We extract several important statements from this report. The following table exhibits for 15 countries the gold value of the principal products of the sea, with the chief producing countries in the order of value:

PRODUCING COUNTRIES.	Products.	Value.
Norway, France, Newfoundland, United States, &c.	Codfish.....	\$93,730,249
Norway, Great Britain, Russia, &c.	Herring.....	17,663,408
United States, Great Britain, &c.	Whale oil..	6,057,987
United States, Nova Scotia, France, &c.	Mackerel...	4,699,687
Norway, France, United States, &c.	Cod-liver oil.	3,449,696
France, Italy, Spain, &c.	Sardines....	3,600,000
Great Britain, Holland, Nova Scotia, &c.	Salmon.....	1,652,784
United States, Great Britain, &c.	Whalebone..	1,407,839
Newfoundland, Norway, &c.	Seal oil.....	767,833
Great Britain.....	Pilchards...	375,000

Another table shows the annual value of the sea fisheries of 22 countries, with the total annual consumption and that *per capita*:

COUNTRIES.	Value of product.	Annual consumption.	Per capita.
Norway.....	\$1,000,000	\$1,000,000	\$8 50
France.....	945,768	945,768	22
United States.....	8,797,955	8,797,955	25
Great Britain.....	3,429,481	3,429,481	83
Russia.....	8,639,568	8,639,568	11
Newfoundland.....	944,898	944,898	3 00
Nova Scotia.....	874,770	874,770	1 19
Holland.....	3,105,630	3,105,630	88
Italy.....	5,428,976	5,428,976	94
Spain.....	5,495,825	5,495,825	85
Japan.....	2,392,685	2,392,685	07
Austria.....	3,613,308	3,613,308	08
Siam.....	1,177,708	1,177,708	10
Canada.....	1,096,770	1,096,770	41
Denmark.....	1,027,991	1,027,991	33
German Zollverein.....	5,500,056	5,500,056	15
Sweden.....	1,126,449	1,126,449	76
Portugal.....	1,695,698	1,695,698	43
New Brunswick.....	192,670	192,670	76
Belgium.....	1,859,099	1,859,099	27
Prince Edward Island.....	100,043	100,043	1 24
Greece.....	823,000	823,000	30
Total.....	\$79,693,264	\$79,693,264	\$9 20

If to this total the product of Turkey, Brazil, Australia, China, &c., were added, the sum would be increased to \$90,000,000 as the annual value of those products of the sea fisheries which are the subject of statistical record. The products of the seas, rivers, and lakes of the United Kingdom, consumed without record in England, have been estimated at more than \$3,000,000 annually; the river herring, shad, whitefish, oysters, &c., sold in the coast and lake fish markets of the United States are valued at over \$7,000,000; and the interior fisheries of Russia in Europe at \$6,000,000. Similar estimates for other countries would produce an aggregate of \$30,000,000, making a total of \$120,000,000 as the annual value of the fisheries, maritime and inland, of the world. The returns of 10 of the countries included in the above table embrace 80,883 vessels and boats, with an aggregate tonnage of 551,456, and 309,682 men; and it is estimated that 450,000 men are directly engaged in the fisheries of the whole 22. The annual value of the commerce in products of the sea fisheries as shown by the returns of 48 countries and dependencies is over \$41,000,000. The following table exhibits the imports, exports, and balance of trade in fishery products of the principal nations:

COUNTRIES.	Imports of foreign produce.	Exports of domestic and foreign produce.	Surplus sold.	Deficiency purchased.
Norway.....	\$36,440	\$12,034,200	\$12,067,620	.....
Newfoundland.....	.....	5,355,157	5,355,157	.....
Nova Scotia.....	.....	3,476,469	3,476,469	.....
France.....	1,	4,277,969	2,961,827	.....
Hawaiian Islands.....	.....	1,486,459	1,486,459	.....
St. Pierre.....	.....	1,293,879	1,293,879	.....
Siam.....	.....	422,292	422,292	.....
New Brunswick.....	.....	408,789	307,480	.....
Prince Edw. Isl.....	.....	329,915	299,915	.....
Japan.....	.....	187,865	187,865	.....
Canada.....	.....	950,811	128,224	.....
United States.....	2,	2,026,747	100,241	.....
Denmark.....	.....	257,660	81,317	.....
Algeria.....	.....	40,509	23,164	.....
German Zollverein.....	4,	.....	.....	\$4,500,066
Russia.....	3,	644,499	.....	2,914,568
Spain.....	2,	260,735	.....	2,495,825
Great Britain.....	6,	3,910,735	.....	2,429,481
Italy.....	2,	858,669	.....	2,578,978
Sweden.....	2,	.....	.....	2,126,449
Austria.....	1,	169,349	.....	1,085,808
Belgium.....	.....	96,000	.....	909,099
Portugal.....	.....	85,540	.....	865,698
Australia.....	.....	.....	.....	512,569
Hamburg.....	.....	.....	.....	727,883
Brazil.....	.....	.....	.....	689,963
Hayti.....	.....	.....	.....	624,124
China.....	.....	.....	.....	532,611
Cuba.....	.....	.....	.....	523,991
Holland.....	1,	1,396,127	.....	5,090

The exports from the Hawaiian Islands were in great part the catch of American whalers sold or exchanged at Honolulu. International fishery exhibitions have been recently held at Amsterdam, Holland; at Bergen, Norway; at Boulogne-sur-Mer, France; and at some other places.—See *Histoire des pêches, des découvertes et des établissements des Hollandais dans les mers du nord*, by B. de Reste (Paris, 1801); "On the Public Fisheries of Great Britain and the Rise and Progress of the Dutch Fishery," by H. Schultes (London, 1818); "A Review of the Domestic Fisheries of Great Britain and Ireland," by Robert Fraser (Edinburgh, 1818); "Frank Forester's Fish and Fishing of the United States and British Provinces of North America," by H. W. Herbert (New York, 1851); "Report on the Sea and River Fisheries of New Brunswick," by M. H. Perley (Fredericton, 1852); "Report on the principal Fisheries of the American Seas," by Lorenzo Sabine (Washington, 1853); "The Sea and its Living Wonders," by Dr. G. Hartwig (London, 1866); *La boutique de la marchande de poissons*, by Martial Deherrypon (Paris, 1867); *La pêche et les poissons*, by H. de la Blanchère (Paris, 1868); *Les grandes pêches*, by Victor Meunier (Paris, 1868); "The Ocean World," by Louis Figuier (London, 1868); "The Harvest of the Sea," by J. G. Bertram (London, 1869); and "Report on the Condition of the Sea Fisheries of the South Coast of New England in 1871 and 1872," by Spencer F. Baird (Washington, 1873).

FISHES, the lowest class of vertebrated animals, red-blooded, breathing through the medium of water by means of *branchiæ* or gills. Like other vertebrates, they have an internal skeleton, the brain and spinal cord protected

by a bony cavity and canal, muscles external to the bones, never more than four extremities, and the organs of special sense in the cavities of the head. Living in a medium heavier than air, and very nearly of the same density as their bodies, locomotion is comparatively easy, and their form, fins, and smooth surface are admirably calculated for rapid progression; breathing by means of air contained in the water, their blood is cold, and consequently their vital energy is less than that of mammals and birds. The brain is very small, and the organs of sense calculated to receive only the simplest impressions of sight, smell, hearing, taste, and touch; generally unable to make any sounds, with an inflexible body, simply articulated limbs, fixed and staring eyes, living in comparative darkness and silence, there is no change in their countenance, no expression of feeling or emotion, no apparent motives in their monotonous existence beyond the necessity of supplying themselves with food, escaping from their enemies, and providing for the continuance of their species. Their chief pleasure is that of eating, and their only danger is from the superior strength and quickness of other inhabitants of the waters or from the artifices of man; to eat, and to avoid being eaten, are the great occupations of their lives, and the varieties of their forms, their instincts, and their favorite haunts are intimately connected with these objects; the movable filaments of the *lophius* or angler, the prolonged snout of the pipe fish and chætodon, the winglike expansions of the flying fish, and the electric armature of the torpedo and gymnotus, are all instruments either for offence, defence, or escape. Cold-blooded, they are little sensitive to changes of temperature, and their migrations and seasons of propagation are less influenced by thermometric conditions than are those of the higher vertebrates; many fishes spawn in winter, and it is in the cold northern waters that the innumerable individuals of the cod and herring species are pursued by man. Even the loves of fishes are marked by the same *sang froid*; very few species have sexual union; in most, the males pursue the eggs rather than the females, and coldly fecundate the spawn of unknown adults, from which arise young which they will never recognize and probably never see. A few females, as the stickleback, deposit eggs in nests made by the males; some carry their eggs and even their young with them for a short period, and feed and protect their little ones like true mothers; but, as a general rule, the joys of maternity are unknown among fishes, and the sexes care nothing for each other even in the breeding season. With all this apparent lack of enjoyment, and low position in the vertebrate series, the class of fishes displays as much and perhaps more variety and elegance of form and beauty of coloration than the more psychically favored birds and mammals; there is not a color of the rainbow, nor a metallic reflection, nor the hue of a precious stone, which may not be

seen in the bands, spots, and scales of fishes. Many tribes of men, both savage and civilized, obtain their principal nourishment from the sea; the countless numbers of cod, mackerel, herring, and other migrating fishes, give employment to thousands of men, and prove important items of national wealth. The habits of fishes, even of the most common species, are comparatively little known from the difficulty of observing them in their native haunts; we know that some are solitary, and others gregarious; some great wanderers, others restricted within narrow limits; some surface swimmers, others remaining at the bottom, or at great depths; some living on sandy bottoms, others in rocky, others in muddy localities; some found only in salt water, others only in fresh, others in both or in brackish waters; some seen only near the shore, others in very deep water far from land; some sluggish like the skates, others active like the sharks and scomberoids; some perish quickly out of the water, as those with widely open gills like the herring, others live a long time after being caught, like the eel, or can travel over land, or climb trees, like the climbing perch (*anabas scandens*).—The external form of fishes is very various, but the head is not separated from the body by a distinct neck, and the trunk generally is continued gradually into the tail; in the skates the tail is long and distinct from the body. The body may be rounded as in the diodon, cylindrical as in the eel, compressed horizontally as in the rays, or flattened vertically as in most fishes; the head may be larger than the body as in the angler, compressed, angular, and obtuse as in the bullhead, prolonged into a beak as in the pipe fish, or the upper jaw may project over the mouth as in the sword fish and sharks; the mouth may open on the under or upper surface, or, as is usual, at the end of the snout, with a greater or less extent of gape. The nostrils may be single as in the sharks and rays, or double as in most fishes. The eyes vary greatly in size and in direction; generally on the sides of the head, in the *uranoscopus* they look upward, and in the flounder family both are on one side. In the cartilaginous fishes the external borders of the gills are attached to the skin, and the gill openings correspond in number to the intervals between the branchiæ; but in the osseous fishes there is a single large gill opening on each side, just behind the head, serving for the exit of the water, after it has been swallowed and made to pass over the gills, the flapping of the gill covers assisting the respiratory process. Some of the apodal or muraenoid fishes have hardly the rudiments of fins; in others, the fins are either vertical and on the median line, or lateral and in pairs. The lateral fins are the pectorals and the ventrals, corresponding to the anterior and posterior limbs of higher animals; the pectorals are attached behind the opening of the gills; the ventrals are generally on the lower surface of the body, and may be variously placed from under the throat,

even in advance of the pectorals, to the origin of the tail. The vertical fins serve the purposes of keel and rudder, and are the dorsal on the back, the anal under the tail, and the caudal at the end of the body. All these fins vary in size and in the number of rays which sustain them, being sometimes spiny, sometimes soft, branched, and composed of many small joints. In the old system of nomenclature, the malacopterygians are bony fishes with soft articulated fin rays; the acanthopterygians, bony fishes in which some of the rays are spiny; and the chondropterygians, the so-called cartilaginous fishes. These classes have been variously subdivided, and the reader is referred to the article ICHTHYOLOGY for the numerous classifications from Artedi to Agassiz. The anus may open far behind the ventrals, move forward with them, and in their absence be situated even under the throat, as in *sternarchus*; the jaws may be armed with different kinds of teeth, which often exist also on the tongue and various parts of the mouth and throat; the lips may be provided with sensitive barbels as in the horn pout, or with fleshy appendages as in the sea raven (*hemitripterus*). The skin may be nearly naked or covered with very small scales; the scales may be rough grains as in the sharks, thick plates as in the sturgeon, a smooth enamelled coat of mail as in the *lepidosteus*, smooth as in the herring, or serrated as in the perch. Along the side of the body is the lateral line, formed by a series of pores, the outlets of the muciparous glands; this line extends from the head to the caudal fin, generally at the mid height of the body, nearer the back in some fishes than in others, sometimes ceasing long before the region of the tail, and occasionally multiple; the scales along this line are arched, notched, or perforated for the protection of the ducts; they are sometimes larger or smaller than the rest, and may be the only ones present; they often have strange forms and armatures. In various parts of the body, but especially about the head, are numerous pores, or water tubes, by which water is introduced into the system, even into the circulation; some are situated along the lateral line. The tissue of the fish skeleton is either cartilage, fibro-cartilage, or bone; the first is found in the sharks and rays, the second in the sunfish (*orthogoriscus*) and angler (*lophius*), and the last in common fishes; the chemical composition is that of other vertebrates, principally the phosphate and carbonate of lime. The osteology of the head, branchial apparatus, trunk, and limbs has been already given as fully as the limits of this work will allow, in the article COMPARATIVE ANATOMY (vol. v., p. 178); for further details see Cuvier and Valenciennes, vol. i., and Owen on "Fishes."—Most fishes are quick in their movements; the salmon, for instance, can swim at the rate of 40 ft. in a second, and can with ease pass over 20 to 25 m. in an hour; progression is effected by lateral strokes of the water by the alternate flexions

of the tail and trunk; the manner in which the vertebrae are connected allows easy motion of the spine from side to side, and the muscles destined to move it are so largely developed as to form the principal bulk of the body; while the vertical fins increase the amount of oar-like surface for purposes of locomotion, the pectorals and ventrals keep the fish in an upright position, and assist in directing its course; the movements of the gill covers, by forcing backward the water which is passing between them, contribute to propel the fish forward. In the pipe fish (*syngnathus*) the dorsal fin in its vibration resembles that of the screw of a steam propeller, and, with a similar action of the tail, causes a forward or backward motion without any apparent movement of the body; the nice adjustment of the movements of the fins of the pickerel, so that while every ray seems in action the fish is perfectly stationary, must have been noticed by every angler. The movements of fishes in a vertical direction are greatly assisted by the swimming or air bladder, which, though anatomically a rudimentary lung, by the air which it secretes enables those that have it to rise or fall in the water by compression or extension exercised by the ribs; it is placed in the abdomen under the spine, and communicates often with the cesophagus or stomach; the air is a product of secretion, and its containing reservoir is sometimes a shut sac; it is often wanting in some species of a genus when others possess it, and is generally very small or absent in ground fishes, such as skates and turbot; in some cases it is considerably vascular, resembling very much a pulmonary sac. The muscles of fishes are generally pale and comparatively soft, divided into parallel layers by aponeurotic laminae; the flavor and odor are very different from those of flesh, and the gases of decomposition are much more fetid. Some fishes have a singular apparatus by which they adhere to other bodies, animate or inanimate; in the remora, of the genus *echeneis*, there is a flattened disk on the top of the head, composed of movable cartilaginous plates, by which it fixes itself to stones or the bodies of other fishes; in the lump fish and other *discoboli*, the ventrals are arranged to act as suckers for attaching them to various substances; the lamprey eel (*petromyzon*) also attaches itself by the mouth to stones and fishes. Referring the reader to COMPARATIVE ANATOMY for details on the nervous system, the organs of sense, the scales, and the digestive apparatus, only general points of interest need be mentioned here. The cavity of the skull is very small compared to the size of the body, and the brain is far from filling it, a considerable space being occupied by a spongy fatty substance; the lobes are placed one behind the other in the following order from before backward: olfactory or lobes of smell, the cerebral hemispheres, the optic or lobes of vision, and the cerebellum. From the scaly covering of their skin, the sense of touch must be obtuse, and the lips are their

only prehensile and principal tactile organs, with the exception of the barbels and other appendages above alluded to. The corneous, slightly movable, and often tooth-armed tongue receives but few nerves, and cannot be the seat of any sense worthy of the name of taste; and moreover, the food does not remain long enough in the mouth for any exercise of this sense. The olfactory apparatus is more complicated, but it is traversed neither by air nor the water used in respiration; the nasal cavities do not communicate with the mouth. The ear, almost always entirely within the cranium, on the sides of the brain, consists essentially of a vestibule and three semicircular canals, which receive the vibrations of the integuments and cranial walls; there is rarely anything that can be called external ear, drum, or tympanic cavity; loud, sudden, and strange sounds frighten fishes, as the experience of every fisherman tells him; in ancient, and even in modern times, they have been taught to come and receive food at the tinkle of a bell, or the pronunciation of pet names. The eyes have neither true lids nor lachrymal apparatus; the pupil is large and permanently open, the lens is spherical, and the flat cornea is covered by the skin. Fishes are very voracious, most of them living on animal food, and swallowing indiscriminately anything of this kind which comes in their way; some genera, like the lamprey eels, live upon the juices of other fish, and the mouth is provided with circular cartilages, fleshy disks, teeth, and a piston-like tongue, which enable them to adhere to any surface. The intestinal canal is short and simple, and digestion is rapidly performed, and their increase in size is remarkably affected by the nature and abundance of their food; their limits as to size and the natural duration of life are very little known in the great majority of species.—The blood of fishes is red, and the globules are elliptical and of considerable size. The heart is placed under the throat in a cavity separated from the abdomen by a kind of diaphragm, protected by the pharyngeal bones above, the branchial arches on the sides, and generally by the scapular arch behind; it consists of a venous sinus, auricle, ventricle, and bulb; all these cavities circulate venous blood, and therefore physiologically correspond to the right side of the mammalian heart, though Owen says that the heart of fishes with the muscular branchial artery is the true homologue of the left auricle, ventricle, and aorta of higher vertebrates, tracing the complication of the organ synthetically; the auricle and ventricle, however, are alone proper to the heart itself, the sinus being the termination of the venous system, and the bulb an addition to the pulmonary artery; these four compartments, therefore, are not like the four divisions of the human heart, but succeed each other in a linear series. The circulation is double, that of the system at large and that of the branchiæ being complete and distinct, and there is also an ab-

dominal circulation terminating at the liver; the peculiar character is that the branchial circulation alone is provided with a propelling cavity or heart, the branchial veins changing into arteries without any intermediate left auricle and ventricle. The venous sinus receives the blood from the general system, after the manner of *venæ cavæ*; it is not usually situated within the pericardium. The auricle, when distended, is larger in proportion to the ventricle than in the higher vertebrates; its walls are membranous, with thin muscular fasciculi, and its simple cavity communicates with the ventricle by a single opening guarded by free semilunar valves, two to four in number. The ventricle, usually a four-sided pyramid, is very muscular, and its fibres are redder than those of any other part of the system; its cavity is simple, the auricular valve generally free and without chordæ tendinæ, and its opening into the bulb provided with two or four semilunar valves. The contractile *bulbus arteriosus* is provided in the ganoids and plagiostomes with several rows of valves, and its muscular walls are distinct from those of the ventricle. The immediate force of the heart's action is applied through the continuation of the bulb into the branchial artery, which is generally short, and is divided into lateral branches going to the gills; the blood, which has become arterialized by its subjection to the air contained in the respired water, is carried along the returning vessels into the branchial veins, the analogues of the pulmonary veins of man; the four on each side form the aortic circle from which the pure blood is sent over the system through the carotids and the aorta and its branches; the blood of the chylopoietic viscera passes through the liver before entering the great sinus. Though all the blood passes through the branchial apparatus, it traverses the heart but once.—Respiration is effected by means of the innumerable vascular lamellæ and tufts attached to the external edge of the branchial arches; these are generally four on each side, each composed of two rows of fringes; in most cartilaginous fishes there are five, and in the lamprey seven; in the last fish there is a canal from the mouth to the respiratory cavity, resembling a trachea. Fishes consume but a small amount of oxygen, but some, not content with that contained in the water, come to the surface occasionally to swallow air; they perish soon out of water in proportion to the quickness with which the gills become dry, asphyxia being produced not by the want of oxygen directly, but because the blood cannot circulate in them properly unless sustained and kept soft by water. Though fishes produce little heat, some possess the singular faculty of generating and discharging electricity. (See ELECTRIC FISHES.)—Fishes reproduce by means of eggs, the number of which in some species amounts to hundreds of thousands; these have generally only a mucilaginous envelope, and are fecundated after being laid;

a few enjoy sexual congress, and are ovoviviparous and viviparous, but the young are almost always left to themselves as soon as born. It is owing to the simultaneous development of great numbers of eggs deposited in the same locality, and to the instinct possessed by some species to keep in company, that fish occur in what are called banks and schools; these schools, composed of individuals kept together only by similarity of food and habits, and in which each one looks out for himself without regard to the wants of the rest, make long migrations from the sea to the rivers and back again, and from one favorite locality to another. At the time of laying the eggs, the migrating species generally approach the shores, and ascend rivers, often coming thousands of miles; year after year, at the same season, the fish appear in immense numbers. The migrations of the herrings, salmon, shad, smelt, mackerel, &c., afford well known instances of these phenomena. All fishes are of distinct sex. The testes vary much in form in the osseous fishes, and are remarkable for their enormous development in the breeding season, when they are called milt or soft roe. The ovaries in most osseous fishes are two elongated sacs, closed anteriorly, and produced posteriorly into short, straight, and wide oviducts, which coalesce before reaching the cloaca; the greatly developed ova are called the roe. There are several interesting points in connection with the development of fishes which will be better introduced here than in special articles. In most fishes it has been already stated that the exclusion of the ova or roe precedes fecundation, and that in a few (the sharks and rays especially) the ova are fecundated before exclusion; when the embryonic membranes contract no adhesion to the uterine walls, the fish is called ovoviviparous, and in such the embryo escapes from the egg before it quits the parent, while in the ovipara the ovum is expelled while the embryo is contained in it; when adhesion takes place by vascular interlacements, the species is said to be viviparous; the great difference between viviparous fishes and mammals is, that in the former the rupture of the membranes takes place long before birth, while in the latter this occurs at the moment of exclusion. The sudden and great increase of the milt and roe is not compatible with a firm bony cavity such as would be formed by ribs and sternum; this explains the physiological reason for their free or floating ribs. At the approach of the breeding season the colors become brilliant, as is familiarly seen in the bright red throat of the male stickleback; the female seeks to deposit her eggs in shoal water, where the heat and light of the sun may bring them to maturity, and the male follows close to diffuse the fecundating milt over them. It is well known that some fishes deposit their eggs in species of nests, as the stickleback, bream (*pomotis*), and lamprey; Aristotle mentions a fish of the Mediterranean, a species of *gobius*, as

making a nest of seaweeds and depositing the spawn in it, the male keeping guard over the female and her young; the bassars, siluroid fishes of Demerara (*calliethys*), make nests of grass and leaves, and both sexes guard the eggs and young; the toad fish (*batrachus*) has been observed on the south shore of Long Island lying concealed in deep holes protecting its young, which attach themselves to stones by means of the yolk sac. Another kind of incubation is found in the pipe fish (*syngnathus*), in which the ova are transferred from the female to a kind of marsupial pouch under the tail of the male, being fecundated during this process, and the cavity closing over them; when the young are hatched they follow the male, and return into the pouch at the approach of danger; the male *hippocampus* or sea horse has a similar subabdominal marsupial pouch. In some species of bagré, a siluroid fish from the rivers of Surinam, the females carry their eggs in the mouth, showing the young in various stages of development even to the fish recently hatched; eggs of two distinct species have been found in the mouth of a single individual. In the aspredos, or *trompettie*, the eggs are attached by pedicles surmounted by cups to the under side of the abdomen as far forward as the mouth, on the sides of the pectoral and ventral fins, and as far as the middle of the tail; after the eggs are hatched the pedicles are absorbed. Viviparous fishes may be divided into two groups: the first includes those in which the gestation is almost wholly ovarian, as in *embiotoca*, *anableps*, *blennius*, &c.; the second those in which the egg enters the oviduct before the development of the embryo begins, as in the plagiostomes. Prof. J. Wyman ("Proceedings of the Boston Society of Natural History," vols. v. and vi.) has described the development of *anableps Gronovii* (see *ANABLEPS*), in which he found the ovarian egg free in a distinct closed sac, as the mammalian ovum is in the Graafian vesicle; when the fetuses escape into the oviduct the gestation is carried on nearly to its completion in the ovisac, which becomes vascular, and by its apposition with the papillæ of the yolk sac carries on the functions of respiration and nutrition. In the *embiotocidae* of California the mode of development is similar; in *E. lineata* Girard found young three inches long and one inch deep; in another genus of the group (*holconotus*) he detected as many as 16 young about an inch long, which had evidently recently escaped from the egg shell; the ovarian gestation here is somewhat different from that in *anableps*, as the young ova are seen between the dividing membranes of the ovary while the fetuses are in course of development in the general cavity of the organ; it is not determined whether their ova leave the ovisac before or after impregnation. Many species of *gadida*, as the cod, haddock, whiting, and American hake, have been found to have a viviparous reproduction, the embryos being developed within the ovary,

thus confirming the supposition of many intelligent fishermen. Internal impregnation is very general in the plagiostomes, and as this is more certain than the indiscriminate spawning of common fishes, the eggs are much fewer in number and of larger size, as in birds; the egg in its passage through the oviduct receives a dense corneous covering, so that the cases resemble oblong flattened pillows, often with long tendrils at the corners, in which the embryo is snugly coiled up; they become attached to objects floating near the surface, and are there developed by the influence of solar light and heat; from the researches of Prof. Wyman it appears that in the skates the eggs are fecundated in the ovary, and that the egg case is formed in advance to receive it as it descends. From these and other structural peculiarities Agassiz has separated the *chimæra*, sharks, and rays from fishes proper, and elevated them into a class, the *selachians*. Many facts go to show that fishes undergo a kind of metamorphosis as well as insects. August Müller has proved that the two genera hitherto considered characteristic of the cyclostome fishes are really different stages of the same animal; he has raised *ammocetes* from the egg of *petromyzon*, and watched the change of the former into the latter genus.—The usual mode of impregnation in osseous fishes, so analogous to the manner in which the fertilizing pollen is brought in contact with the stigmata of flowers, naturally suggested the idea of artificial impregnation; and this has been successfully practised both by naturalists for the study of embryology, and by fish breeders as a profitable branch of industry. (See FISH CULTURE.)—In most fishes the young when hatched are left to shift for themselves, and of course the greater number are devoured by larger fish, aquatic birds, and reptiles; many species devour each other; small mackerel are often found in the stomachs of larger individuals, when they are abundant; so that with all their fecundity the class of fishes does not multiply beyond the limits set by nature. Though fishes are cold-blooded, and the watery element is less affected by sudden changes of temperature than the air, there are external circumstances which limit their distribution both in depth and extent of surface. The difference in density and chemical constitution of salt and fresh water draws the line between the marine and the fluviatile faunæ; below a certain depth, probably not far from 120 fathoms, the absence of light and the increase of pressure would prove an insurmountable barrier to most of the class. Fishes are able to resist extreme cold, and to regain vitality after having been apparently frozen, but the average of cold has an important influence on their geographical distribution; the average temperature of the water for the year has been usually taken as the regulator of this distribution, but Dana has shown that the line of temperature established by the average of the 80 coldest days in the year gives the clue to the limits of the marine faunæ. A

few arctic species are the same in America and Europe, migrating southward from the same northern centre; but below this region the marine fauna of America is essentially tropical, and that of Europe essentially temperate. In the Atlantic the zones of temperature are remarkably modified by the Arctic, Gulf stream, and African currents; on the American side the temperate zone extends only from Cape Cod to Cape Hatteras, about 10 degrees of latitude, while on the eastern it extends from the Swedish coast to the Cape Verd islands, nearly five times as many degrees; while the tropical zone, which in America extends from Cape Hatteras to 25° S., or 60 degrees, on the other side embraces only about 20 degrees on the Guinea coast of Africa. As a few instances of local distribution, in contradistinction to the cosmopolitan scomberoids and cyprinoids, may be mentioned the American cottoids and goniodonts, the Mediterranean sparoids, the tropical *sciænoids*, *squammipenna*, and mullets; the *pleuronectids* of the temperate regions; the tropical fresh-water *characini* of America and Africa; the true salmon of arctic and cold regions; and the marine labroids, and fresh-water chroidids. Estimating the number of vertebrates at 20,000, the number of living species of fish may be set down at 10,000, of which more than 6,000 are described.—Of all the vertebrata, fishes are by far the most numerous and widely distributed in the earth's strata; their remains are found from the Silurian to the tertiary formations, and are of great aid in determining the changes of the surface of our planet during successive and long geological periods. The first great geological division, the primary age, comprises the lower and upper Silurian and the Devonian; till the close of this age there were no air-breathing animals, and in the Devonian period fishes were the lords of creation; the latter has, therefore, been very properly called the "age of fishes." Agassiz, in his *Recherches sur les poissons fossiles* (1838-'43), laid the foundation of fossil ichthyology; 1,000 species are described in the most complete and scientific manner, with superb illustrations. He divides fossil fishes, as he afterward did the recent ones, into four orders, according to the form and structure of their scales; these orders, ganoids, placoids, ctenoids, and cycloids, have been sufficiently described in the article COMPARATIVE ANATOMY (vol. v., p. 172). Three fourths of all known fossil fishes belong to the ctenoids and cycloids, which occur in all formations from the chalk upward; the remaining fourth belong chiefly to the ganoids (with enamelled scales like the garpike and sturgeon) and the placoids (like sharks and rays), and extend through all the fossiliferous strata, but are most numerous in the coal, Jurassic, chalk, and tertiary formations; no fish with ctenoid scales (like the perch) or cycloid (like the ood) is found below the chalk. The forms of the earlier fishes were many of them very strange; the pectorals were

very small and always in advance of the ventrals; above the chalk, the ventrals begin to approach nearer the head; they were not so fully developed as our fishes, but seem to have been, like the sturgeon, arrested in their development. During this epoch the sea covered the greater part of the surface of the globe, and all animals whose remains have been preserved were without exception aquatic, breathing by gills; the climate must have been uniform and warm; the dry land had hardly appeared above the waters, and all creation was as silent as in mid ocean.—For the systematic classification of fishes, and the history of the science, see ICHTHYOLOGY.

FISH HAWK, a bird of prey, of the family *falconidae*, subfamily *agulinæ*, and genus *pandion* (Savigny). This genus, which belongs to the same subfamily with the eagles, is characterized by a short bill, curved from the base to the acute hooked tip, compressed laterally with slightly festooned margins; wings extending

per parts, wings, and tail, deep umber brown, the latter having about eight bands of blackish brown; numerous spots of pale yellowish brown on the breast; bill and claws bluish black; tarsi and toes greenish yellow; the tibial feathers short, and the tarsus feathered one third the way down in front; the young have the upper parts edged with white. This well known species inhabits the continent from the Atlantic to the Pacific; its powerful and protracted flight, and the dexterity which it displays in catching fish, render it conspicuous among our birds of prey. It is one of the most sociable of the hawks, migrating in considerable numbers along the coast in spring and autumn; it is mild, even timorous in its disposition, rarely quarrelling with its mates, and even nesting on the same tree with birds which other members of its family would chase or destroy; the readiness with which it yields its prey to the eagle has been alluded to under that head. It never pursues its prey in the air; flying at a moderate height above the water, when it sees a fish within its reach it closes its wings, and plunges headlong, sometimes entirely disappearing below the surface; if successful, it retires to its nest or to a tree to eat it at leisure; it is said sometimes to strike a fish too heavy for its strength to raise, and, unable to free itself, to be drawn under water and drowned. Though a heavy flier compared to the eagle, its flight is high and its motions graceful; in the rare instances in which it alights on the ground, it walks in a very awkward manner. The fish hawk appears in the middle states from the south about the beginning of April, and is welcomed by the fishermen as the forerunner of various kinds of fish; it goes southward again as winter approaches. The males arrive eight or ten days before the females; during the love season both sexes assist in making new nests and in repairing old ones, and in incubation; the nest is placed in the fork of a high tree near the water, and is composed of sticks, grass, and seaweeds, firmly united, three or four feet wide and as many deep. As evidence of its gentle disposition, Audubon says that he has seen the fish crow and purple grackle raising their families in nests built among the outer sticks of the fish hawk's nest. The eggs are three or four in number, broadly oval, yellowish white, with numerous large irregular spots of reddish brown; the young are carefully fed and protected, and often remain in the nest until they are as large as the parents; only one brood is raised in a season. When wounded, they defend themselves with bill and claws; they are capable of flying off with a fish weighing 5 lbs.—The fish hawk of Europe resembles very much the American bird.

FISHKILL, a town and village of Dutchess co., New York, on the Hudson river and the Hudson River railroad, opposite Newburgh, 55 m. N. of New York; pop. of the town in 1870, 11,752; of the village, 787. The village is

American Fish Hawk, or Osprey (*Pandion Carolinensis*).

to tip of tail, the second and third quills equal and longest; tail moderate and rather even; general form heavier and less adapted for rapid and vigorous flight than that of the eagles; tarsi short and strong, covered with small circular scales; toes very rough beneath, long, and united at the base; claws long, curved, and sharp. Gray describes only three species: *P. Carolinensis* (Gmel.) in America, *P. haliaetus* (Linn.) in the old world, and *P. leucocephalus* (Gould) in Australia. These species are nearly allied to each other, and inhabit the temperate regions, in the vicinity of lakes, rivers, and shallow arms of the sea; they have been seen several hundred miles from land, probably driven off the coast by severe storms.—The female American fish hawk; or osprey, is 25 in. long, with an extent of wings of about 5 ft.; the male is somewhat smaller. In the adult the head and under parts are white; a stripe through the eye, the top of the head and up-

situated on Fishkill creek, a small affluent of the Hudson, about 5 m. N. E. of its mouth, and contains four churches, a weekly newspaper, and a national and a savings bank. The town also contains the villages of Fishkill Landing, Glenham, Matteawan, Carthage Landing, Hughsonville, and a part of Wappinger's Falls. Fishkill Landing is situated on the Hudson, near the mouth of Fishkill creek, and is connected by ferry with Newburgh; pop. 2,992. It contains an iron foundry and machine shop, several factories, a national bank, two newspapers, and three churches. Glenham, Matteawan, and Wappinger's Falls are also important manufacturing places. The Dutchess and Columbia division of the New York, Boston, and Montreal railroad extends through the town from E. to W., and connects with the New York and Harlem and the Connecticut Western railroads at Millerton.

FISK, Wilbur, an American clergyman and educator, born at Brattleboro, Vt., Aug. 31, 1792, died at Middletown, Conn., Feb. 22, 1838. He was educated at the grammar school in Peacham, Vt., at the university of Vermont, and at Brown university, where he graduated in 1815. He then began the study of law, but in 1818 entered the itinerant ministry of the Methodist Episcopal church. In 1823 he was presiding elder of the Vermont district. The following year he left the itinerant work to devote himself to the cause of Christian education. At the date of his entering the ministry there was not a single literary institution of importance under the auspices of the Methodist church in America. In connection with others he founded the academy of Wilbraham, Mass., of which he became principal in 1826. In 1828 he was elected bishop of the Canada conference. The following year he was chosen at nearly the same time president of La Grange college, Alabama, and a professor in the university of Alabama. The Wesleyan university, Middletown, Conn., was founded in 1830, and Dr. Fisk, having declined all other appointments, was elected its first president. In the general conference of 1832 he was foremost in advocating the establishment of the Oregon mission. On account of impaired health, he made the tour of Europe in 1835-'6. During his absence he was elected bishop of the Methodist Episcopal church, but declined the office, to continue that work in which he had become the representative man of his church. His chief works are: "Sermons and Lectures on Universalism," "Reply to Pierpont on the Atonement," "The Calvinistic Controversy," and "Travels in Europe." His life has been written by the Rev. Joseph Holdich (1842).

FISTULA (Lat., a pipe), an ulcer in the form of a narrow canal, more or less deep and sinuous, lined by a pale false mucous membrane, indolent and indisposed to heal, kept up by some local pathological condition of the soft parts or bones, or by the presence of some foreign irritating body, and leading or not to a

suppurating cavity. There may be a single external or internal opening, or there may be a communication between the skin and the mucous, serous, or synovial cavity. Some writers restrict the term fistula to such of the above lesions as take their origin from some natural cavity or excretory duct, while those communicating with abscesses and caused by foreign bodies or disease of the bones are called fistulous ulcers or sinuses; but the distinction is of little importance, as the pathological conditions and the principles of treatment are the same. Fistulas arise when abscesses are not thoroughly healed from the bottom, when any irritating substance (as a ligature or a piece of dead bone) remains in the tissues, or after wounds of excretory ducts. If superficial and of recent origin, fistulas may heal of themselves; but if deep-seated or chronic, they generally require surgical interference. They are usually rather tedious and annoying than dangerous; but when large, deep, with several openings and profuse discharge, they may produce hectic fever and fatal exhaustion. The principles of treatment are: to remove any irritating cause, as a piece of dead bone or foreign body; to prevent the accumulation of matter, by counter openings, if necessary, and by properly directed compression; and to excite adhesive inflammation by pressure, stimulating injections and applications, setons, caustic, and, as a last resort, incision of the fistula, that the soft parts may have an opportunity of healing from the very bottom of the wound; the constitution should also be strengthened by nourishing diet and tonic medicines. The most common varieties are the anal, lachrymal, salivary, and urinary fistulas.—Anal fistula is situated by the side of the *sphincter ani* muscle, and is difficult to heal both on account of the constant muscular contractions and the passage of fecal matter into it. There may be an opening into the bowel internally and externally, either or both; according to Brodie, this affection always begins by an ulceration on the side of the rectum into which the fecal matter escapes, causing abscess and consequent fistula; but in some cases there is no opening into the bowel, the sinus reaching only to its outer coat; this affection is frequently a painful complication of consumption. The simple and efficient remedy for this fistula is division of the walls from the internal opening to the skin, so as to prevent muscular contractions; after this operation the introduction of lint allows the wound to heal by granulation from the bottom. This affection is considerably more common in males than in females.—Lachrymal fistula is situated at the inner corner of the eye, and communicates with the lachrymal sac; it begins by an obstruction of the nasal duct, followed by inflammation, abscess, and fistulous opening. Besides the usual remedies for acute and chronic inflammation, the obstructed duct may be restored by the introduction of a metallic or elastic style. In a similar manner the

duct of Steno may be obstructed, so that the saliva dribbles out on the cheek instead of passing into the mouth; the remedy is to establish the passage from the fistula to the mouth by puncture and the introduction of silk or flexible wire, and then paring and uniting the edges of the external opening.—In urinary fistula there is an opening from the perineum into the urethra, through which the urine dribbles wholly or in part; it is generally caused by urinary abscess and extravasation into the soft parts. For its relief all strictures should be dilated, the urethra brought to a healthy condition, and the fistula stimulated to contract and granulate by external applications. Sometimes there is a communication between the urethra and the rectum. But the most disgusting and difficult to remedy are the vesico-vaginal and recto-vaginal fistulas, in the former of which the bladder, and in the latter the rectum communicates with the vagina; both of these affections are the consequences of the laceration and sloughing after tedious labor; the most successful method of treatment is by paring the edges of the fistula and uniting them by sutures.—A fistula may communicate with any of the abdominal viscera, or with any part of the body, on the surface or deep-seated, that is diseased from abscess, dead bone, or the presence of a foreign substance.

FITCH, Asa. See supplement.

FITCH, Ebenezer, an American clergyman, the first president of Williams college, born in Norwich, Conn., Sept. 26, 1756, died in West Bloomfield, N. Y., March 21, 1833. He graduated at Yale college in 1777, where in 1780 he was appointed tutor, and continued to act as such for several years. In 1790 he was chosen preceptor of the academy in Williamstown, Mass., and when in 1793 it grew into and was incorporated as Williams college, he was elected its first president, which office he filled till 1815, when, resigning, he was chosen pastor of the Presbyterian church in West Bloomfield, N. Y. This charge he held till 1827, and after his resignation continued to preach occasionally almost till his death.

FITCH, John, an American inventor, and the pioneer in steam navigation, born in Windsor, Conn., Jan. 21, 1743, died in Bardstown, Ky., in June or July, 1798. He worked on his father's farm till the age of 17, when he was employed for some time on coasting vessels, and then became apprentice to a clock maker. On reaching manhood he commenced business as a brass founder in a small way, failed in an attempt to manufacture potash, married unhappily, separated from his wife, and settled in New Jersey as a button maker and silversmith. When the revolutionary war broke out, he was elected a lieutenant in the New Jersey line; but on meeting with some real or supposed injustice he left the service, and was employed by New Jersey as armorer of the troops. Driven away by the invading army, he engaged in his trade of silversmith in Bucks co., Pa., till the approach of the enemy again made it necessary

for him to shift his quarters. He next supplied the American troops at Valley Forge with tobacco, beer, and other articles, in which he drove a prosperous business, resulting in a considerable accumulation of depreciated continental money. With this he purchased Virginia land warrants and removed to Kentucky, where he was appointed deputy surveyor. Being captured by the Indians, he was marched through the wilderness to the British post at Detroit, where he was detained some time as a prisoner. He was at length exchanged, and finding his way again to Bucks co., formed a company for the survey and purchase of lands in Kentucky and Ohio. On his return from these surveys, by which he acquired several hundred acres of land, he petitioned congress for an appointment as surveyor, and while awaiting the unsuccessful result of his application prepared a map of the N. W. country, which he engraved on a sheet of copper and printed on a press of his own manufacture. In April, 1786, the idea occurred to him of propelling a carriage along an ordinary road by the force of steam. After a week's study he abandoned it as impracticable, and devoted himself to the application of steam to the propulsion of vessels. He immediately sought to interest leading men in Pennsylvania in the project; in August following he addressed a petition to congress in regard to it, and in September presented a drawing of the boat, models, and tube boiler to the American philosophical society. He next petitioned the legislature of Virginia for aid. James Madison presented his memorial, and Patrick Henry, then governor, took an interest in the plan. But the legislature was slow, and Fitch conceived the plan of raising the necessary funds by the sale of his map. He accordingly executed a bond to Gov. Henry in the sum of £350, conditioned that if he should sell 1,000 copies of his map at 6s. 8d., he would in nine months thereafter exhibit a steamboat in the waters of Virginia. Nothing came of it. The assembly of Pennsylvania was next applied to, and encouraged him to the extent of a favorable report of a committee. The assembly of Maryland did the same; but there were no funds in her exchequer. The legislature of New Jersey rejected a proposition to grant £1,000, but gave Fitch an exclusive privilege for 14 years for the use of boats propelled by fire or steam. Disappointed in these efforts, Fitch formed a private company, and in April, 1786, the working model of a steam engine with a one-inch cylinder was the humble commencement of his enterprise. In three months' time he moved a skiff on the Delaware by his new contrivance at a speed satisfactory to the associates. In March, 1787, a bill vesting in John Fitch exclusive rights in the steamboat passed the legislature of Pennsylvania, and similar laws were enacted in Delaware and in New York. In August of that year a new steamboat was tried on the Delaware, with an engine of 12-inch cylinder. Though the boat did not

attain sufficient speed to answer the purpose of a packet, the trial proved conclusively the efficiency of steam as a motive power for vessels. To increase this efficiency it was only necessary to enlarge the machinery. Soon after this success the company learned for the first time that James Rumsey of Virginia claimed to be the first inventor of the steamboat, and to have made a prior successful trial. A war of pamphlets followed. An examination of the evidence leaves no reason to doubt that the first practical success in steam navigation was made by Fitch. It is probable enough that Rumsey had entertained the idea of propelling a boat by steam before it occurred to Fitch, as it had previously occurred to others. In 1788 Fitch built a second boat for the old machinery, which made several passages between Philadelphia and Burlington at the rate of four miles an hour. More power was requisite for commercial success. A boat built for an engine of 18-inch cylinder was ready for trial in August, 1789. After several failures, and changes in the machinery, this boat was successfully tried in the spring of 1790, and was run as a passenger boat on the Delaware, making during the season more than 2,000 miles at an average speed of $7\frac{1}{2}$ miles an hour. But more money was wanted to introduce the invention, and the numerous stockholders in the enterprise could not be brought to respond to further assessments. Time ran on, and Fitch was cramped for the necessities of life. He repeatedly asserted that the passenger traffic of the great western rivers would one day be carried on exclusively by steam; that ships of war and packet ships would navigate the Atlantic by steam; and that some one to come after him would reap fame and fortune from his invention. He now sought some small office under the government of Pennsylvania and that of the United States, but was disappointed. Failing to interest new parties in his project, and the company absolutely declining to make further advances, Fitch abandoned his boat, and for some months wandered about the streets of Philadelphia, a ruined man, with the reputation of a crazy projector. On Oct. 4, 1792, he presented a sealed envelope containing manuscripts to the library company of Philadelphia, with a request that it might be kept unopened till 1823. In 1798 he went to France in pursuance of a contract with Aaron Vail, contemplating the introduction of his invention in Europe; but the times were not propitious, and the means and patience of Fitch were exhausted. On his return he remained a while in London, and in 1794 he worked his passage to the United States as a common sailor, landed at Boston, and spent nearly two years at East Windsor. In the summer of 1796 he was in New York, and placed a small boat on the Collect pond, worked by a submerged wheel at the stern, which has been described as a screw propeller. Soon after he visited Oliver Evans in Philadelphia, and expressed his in-

tention of forming a company to introduce steamboats on the western waters. With this view, and to ascertain the condition of his western property, he went to Kentucky, where he found his land overrun with squatters, and no encouragement for his steam projects. Mortified by his inability to carry out his great project, and wearied by the lawsuits in which he had been engaged for the recovery of his lands, Fitch became despondent and desperate, and terminated his life by swallowing a dozen opium pills which had been left with him from time to time by his physician to use as anodynes. The sealed envelope was formally opened by the directors of the library company in 1823, and was found to contain a detailed history of his adventures in the steamboat enterprise, inscribed "To my children and to future generations," with a journal and other papers, from which his biography was prepared by Thompson Westcott (Philadelphia, 1857). A memoir of Fitch by Mr. O. Whittlesey is in Sparks's "American Biography."

FITCHBURG, a city and one of the county seats of Worcester co., Massachusetts, on a branch of the Naahua river, 40 m. N. W. of Boston; pop. in 1850, 5,120; in 1860, 7,805; in 1870, 11,260, of whom 2,517 were foreigners. It embraces the villages of Crocker-ville, Rockville, South Fitchburg, Traskville, and West Fitchburg. It is the terminus of four railroads: the Fitchburg, to Boston; the Fitchburg and Worcester, to Worcester; the Vermont and Massachusetts, to Brattleboro; and the Cheshire, to Keene and Bellows Falls. It is also connected with Boston *via* South Framingham by the Boston, Clinton, and Fitchburg railroad. The river furnishes abundant water power, and manufacturing is extensively carried on. The principal establishments are 14 machine shops, turning out steam engines, mowers and reapers, machinists' tools, &c., and employing 1,000 men; several chair factories, employing 500 men; 3 paper mills, with 200 hands; 2 iron foundries, 1 brass foundry, 3 manufactories of edge tools, 1 of boots and shoes, 3 of sash, doors, and blinds, 1 of files, 1 of cotton duck, 2 of beaver cloths, 1 of cassimeres, 1 of shoddy, and 1 of carpet yarn. There are 2 national banks, with an aggregate capital of \$500,000, 2 savings banks, with deposits amounting to over \$2,500,000, and a fire insurance company. The city has a small police force, an efficient fire department, water works, and gas works. The public buildings include a masonic and an odd fellows' hall, a city hall, a jail, and a court house. A monument to the memory of the soldiers who fell in the civil war has recently been erected. There are 37 public schools, taught by 49 teachers, viz.: 1 high, 8 grammar, and 28 of inferior grades; a public library containing over 9,000 volumes, and two weekly newspapers. There are ten churches.—Fitchburg, which at first formed part of Lunenburg, was incorporated as a separate town in 1764, and as a city in 1872.

FITZGERALD, I. Edward, lord, an Irish soldier and politician, fifth son of the first duke of Leinster, born near Dublin, Oct. 15, 1763, died June 4, 1798. He was in part educated in France, entered the British army, and distinguished himself as aide-de-camp to Lord Rawdon in the latter part of the American revolutionary war, and was severely wounded in the battle of Eutaw Springs. After sitting for some time in the Irish house of commons, and travelling on the continent, he rejoined his regiment in Canada. He returned to Ireland in 1790, and was again elected to the Irish parliament. In 1792 he visited Paris, where he became associated with some of the leading revolutionists. At a banquet given by Englishmen in Paris, he publicly renounced his nobility, and proposed a toast to the success of the republican arms, and was consequently dismissed from the British army. He then returned to Dublin, joined the society of United Irishmen, of which he was made president in 1796, encouraged other political and military organizations, defending them in the Irish parliament, and negotiated with the French directory, till a warrant was issued by government for his apprehension. He refused to abandon his associates, but secretly directed the revolutionists from a place of concealment in Dublin after the other principal leaders had been arrested, and was at length discovered and captured after a desperate struggle. He was severely wounded, and died in prison. His biography was written by Thomas Moore (2 vols. 8vo, London, 1831). **II. Pamela**, lady, wife of the preceding, reputed daughter of Mme. de Genlis and Philippe duke of Orleans (*Égalité*), died in Paris in November, 1831. She was educated with the children of the duke, as an English orphan. She was married to Lord Fitzgerald at Tournay in 1790, and after his death to Mr. Pitcairn, American consul at Hamburg. A separation ensued, and she resumed the name of Fitzgerald, and lived at Montauban till 1830, when Louis Philippe, the associate of her childhood, being called to the throne, she went to Paris. The king refused to receive her, and she died poor.

FITZGERALD, Percy H. See supplement.

FITZHERBERT, I. Sir Anthony, an English lawyer and jurist, born in Norbury, Derbyshire, died in 1538. After a distinguished career at the bar, he was appointed in 1523 a justice of the court of common pleas, and held that office until his death. He was the author of a work in old French, which is of great authority in the law, entitled *Le grande abridgement collecte par le juge très reverend, monsieur Anthony Fitz-Herbert* (printed by Pynson in 1514, by Wynkin de Worde in 1516, and again in 1577). Among his other works on legal subjects was "The Office and Authority of Justices of the Peace" (1538, often reprinted; last ed., 1617), and "The New *Natura Brevium*" (1534; last ed., 1794, with a commentary attributed to Chief Justice Hale, and

notes and references). His "New Treatise for all Husbandmen" (4to, London, 1528) passed through more than 20 editions. **II. Thomas**, a learned English Jesuit, grandson of the preceding, born at Swinnerton, Staffordshire, in 1552, died in Rome in 1640. After various fruitless attempts to induce the Roman Catholic powers of Europe to aid the Roman Catholics of England, he entered the society of the Jesuits, and for the last 22 years of his life presided over the English college at Rome. He wrote a number of treatises of a religious and controversial character.

FITZHERBERT, Maria, wife of George IV. of England, born in July, 1756, died in Brighton, March 29, 1837. Her father, Waller Smythe of Brambridge, Hampshire, was of an old Catholic family, and she was married successively to Edward Weld of Dorset and Thomas Fitzherbert of Stafford, being left a widow a second time in 1781. In 1785 the prince of Wales, afterward George IV., first saw her, and in December of that year they were privately married by a clergyman of the established church, in the presence of witnesses. The union, being contrary to the English statute, which prohibits marriage between a subject and a prince of the blood royal, was not valid in law. Subsequently the prince contracted a legal marriage with the princess Caroline of Brunswick; but after his quarrel with Queen Caroline he returned to Mrs. Fitzherbert. His excesses, however, compelled her to leave him, and she retired to Brighton, where she passed the remainder of her life, receiving a large pension from the government. —See "Memoirs of Mrs. Fitzherbert," by the Hon. Charles Langdale (London, 1856).

FITZROY, Robert, a British admiral, born at Ampton Hall, Suffolk, July 5, 1805, died April 30, 1865. He entered the navy in 1819, and obtained his first commission Sept. 7, 1824. After serving on the Mediterranean and South American stations, he was appointed in 1828 to the command of one of the vessels which had been sent by the government, under Capt. King, upon an expedition to explore and survey the coasts of Patagonia, Chili, and Peru. In 1831 the *Beagle*, under his command, was fitted out for another surveying expedition. Charles Darwin accompanied this expedition as naturalist, and after its return in 1836 published a journal of the researches made upon it into the geology and natural history of the countries visited. In 1841 Capt. Fitzroy represented the city of Durham in parliament, and in the following year was appointed acting conservator of the river Mersey. In 1843 he became governor and commander-in-chief of the colony of New Zealand, which offices he held for three years. In 1854 he was placed at the head of the meteorological department of the board of trade, in 1857 was appointed rear admiral, and in 1863 vice admiral. In 1862 he established a system of storm warnings. He committed

suicide in a fit of mental aberration, brought on by overtaxing his brain in the performance of his duties. He was the author of several works, the most important of which was the second volume of the "Narrative of the Surveying Voyages of H. M. S. Adventure and Beagle, between the years 1826 and 1836" (London, 1839), the first volume being by Capt. King, and the third by Darwin.

FITZWILLIAM, William Wentworth Fitzwilliam, fourth earl of that name in the peerage of Ireland, and second in that of England, an English statesman, born May 30, 1748, died Feb. 8, 1833. He opposed the ministry of Lord North in the American war of independence, but did not take office when his uncle, the marquis of Rockingham, formed a new cabinet in 1782. Although a political friend of Fox, he abandoned him upon hearing his eulogies of French revolutionary principles, and took office as president of the council, July 11, 1794, when the duke of Portland became the nominal head of the cabinet. In 1795 he was lord lieutenant of Ireland, in the height of the disturbances which then agitated that country; but was recalled after a few months, against the decided wishes, it is said, of the Irish people, for having supported a bill presented by Grattan in favor of Catholic emancipation. He was president of the council for a short time in 1806, on the death of Mr. Pitt, but his liberal views kept him out of office during the greater part of his career.

FIUME (Illyrian, *Rjeka*; Lat. *Vitopolis*, afterward *Fanum Sancti Viti ad Flumen*; Germ. *St. Veit am Flaum*), a royal Hungarian city and free port, situated in a valley on the gulf of Quarnero, at the mouth of the Fiumara, 88 m. S. E. of Trieste; pop. in 1869, 18,809, of whom 14,089 belong to the city proper. The old part of the town, on the slope of the hill, is poor-looking and gloomy; the new part, which stretches along the coast, is well built, cheerful, and neatly paved. It has a provincial and district court, a chamber of commerce and industry, two gymnasia, a naval academy, and many remarkable buildings, including churches, the government house, the city hall, a market hall with colonnades, a nunnery, a hospital, and the casino, which contains concert and ball rooms, and a theatre. In the vicinity is an ancient castle. The harbor admits only small vessels, larger ones anchoring in the gulf at a distance of 3 m. The products consist chiefly of linen, woollens, leather, earthenware, sugar, wax, beer, and rosoglio; the exports, mostly the produce of Hungary, are wheat, wine, tobacco, hemp, timber, rags, &c. There are extensive sugar refineries, mills, tanneries, and paper manufactories; but the principal industry is ship building, from 20 to 30 sailing vessels being annually built. It is connected with the interior by two railways. Fiume became a free port in 1722, and is now one of the most important seaports of the Austro-Hungarian empire. In 1869 the entrances were 2,739

vessels of 135,484 tons.—*Vitopolis* is mentioned as a flourishing town of Liburnia under the Roman emperors. Subsequently the town several times changed its rulers, until in 1471 it was incorporated with the dominions of the house of Hapsburg. Maria Theresa in 1776 united it with Hungary as a *corpus separatum*. From 1809 to 1814 it was occupied by the French. In 1814 it fell again to Austria, and in 1822 it was once more united with Hungary. In consequence of the revolution of 1848-'9 it was united with the crownland of Croatia, but in 1870 it was made an independent district, with a royal governor of its own, directly under the central government of Hungary.

FIXTURE, a word of frequent use, and in regard to which some little confusion exists, because the exact legal definition is precisely opposed to the meaning commonly given to the word. A fixture, in law, is a personal chattel in some way annexed to the realty, but such, or so annexed, that he who put it there may take it away. We apprehend that the common meaning of the word is, a thing so fixed to the realty that it cannot be taken away. That is, an ornament, or utensil, or addition of any kind, is commonly called a fixture, if so affixed to the land (or to the house) that the owner of the land necessarily owns the thing, and it cannot be removed without his permission. Kent uses the word in both senses, but rather inclines to the common meaning; and for convenience, through this article, we shall mean by fixtures things so fastened to the land (or to a house which is fastened to the land) that they cannot be removed against the will of the owner of the land.—The first remark to be made is, that the whole modern law, which permits a great number of things to be attached to the land and thence removed by the occupier without reference to the will of the owner of the land, is in derogation of the common law. That originally regarded land as almost everything, and personals as of little value; and it was a nearly invariable rule that anything which was once attached or annexed to the land, or made a component part of anything so annexed, became at once the property of the owner of the land. This is certainly not the law now in England or the United States. Whether a thing was a fixture or not, was formerly made to depend almost entirely upon the intention with which it was put up or annexed; and this was gathered from slight indications. Thus, the same thing was a fixture if nailed on that remained personal property if screwed on, because the use of screws, which can be unscrewed, indicated the intention of removing it. Intention still remains a very important test; but another has come to be of almost equal value, viz., the capability of removal without injury to the premises, or the possibility of taking the thing away and restoring the premises to the same order and condition in which they were before it was annexed.—The earliest relaxations from the ancient rule were made in

favor of what are sometimes called trade fixtures; by which is meant all those additions which the tenant of a house or land makes for the purpose of carrying on his trade or business. It cannot now be denied that a very wide power of removal has been allowed to tenants in cases of this kind. To illustrate this by instances: it has been adjudged that a tenant might take away (having put them on the land for purposes of trade or manufacture) furnaces, iron backs to chimneys, grates, pumps, vats, cisterns, coppers, tubs, blinds, verandas, fire engines, steam and gas machinery, or even sheds, shops, and other buildings, and the like, even when these things are built into brick walls or rooms, or set on stone or brick foundations. Indeed, we doubt whether the courts of the United States would now stop short of saying that any implements or instruments of trade may be taken away by an outgoing tenant, if he can remove them and restore the premises substantially to their original condition. Not long after the relaxation in favor of trade, it was admitted by the courts that many things might be taken away by an outgoing tenant which he had put up and fastened to the house, either for mere ornament or for domestic convenience. Under this head are now included a great variety of things, such as mirrors, marble slabs and chimneypieces, window blinds, doors, windows, baths, gas pipes and lights, stoves, fire grates, and ranges. It is difficult to draw an exact line here, but it must be said that the law is not so liberal in permitting things of ornament or convenience to be removed as things of trade; and the rule is more strictly applied, that the premises are not to be disfigured or injured by the removal. There are certain things about which the adjudication is as yet conflicting, such as trees planted out, conservatories, hot-houses, and other structures for gardening. Here we should say that a nurseryman who put these things up for trade might certainly remove them, on the same condition of putting the premises in good order as before. But a mere tenant for occupation, who had put them on the land for his own enjoyment, might be obliged to leave them, although we incline to think that he would be permitted to take them away, leaving, of course, the premises wholly unimpaired by the removal.—The same thing will be a fixture as to some persons, but not as to others. Thus a man who sells a house most certainly sells with it, and therefore cannot take away from the buyer, very many things which an outgoing tenant who put them there may remove when he goes. Here the law, instead of being liberal, professes to be strict; and the seller would be permitted to claim and sever from the land only those things which were evidently as free from all attachment to it as mere articles of furniture. And if he had fastened any things down, so as to give them the appearance of being a part of the house, it might be doubted whether he would be permitted to remove them. The same strict

rule would be applied as between the heir who takes the land and the executor or administrator who takes the personals; and so it would be between lessor and lessee or mortgagee and mortgagee. Indeed, it may be said, in general, that in the matter of fixtures the law is extremely liberal as to the right of outgoing tenants to remove things of trade, and nearly as much so as to the same persons in respect to things of convenience or ornament; but very strict as to any disposition made of the land by the owner of it. In these rules, it is supposed, the law gives effect to the actual intent of the party attaching the article to the land; the owner being supposed to intend it to remain, because at the time he can generally have no interest in having it considered a severable chattel, while the tenant in making a similar annexation may be supposed to have his own interest in view, which could only be subverted by retaining the ownership in himself instead of making the thing annexed a part of the landlord's estate. The general rule is that a tenant must remove during the term all he has a right to take away; and whatever he does not remove he is considered as having intended as a permanent fixture, though if he removes them before finally surrendering possession it will probably be sufficient, and a tenant at will or other tenant whose lease is determined by the will of the landlord, or by some other event unexpectedly, would be entitled to a reasonable time in which to exercise this right. It is common and very prudent to provide in leases for the removal of articles which the tenant expects to put up and take away.

FLACIUS (originally **VLAČICH**), **Matthias**, surnamed **ILLYRICUS**, a German Protestant theologian, born at Albona, Istria, about 1520, died in Frankfort in 1575. He was induced to abandon his original intention of entering a convent, and to visit the German universities. At Wittenberg he heard Luther and Melancthon, adopted their opinions, and was appointed professor of Hebrew. After the death of Luther he resisted the formulary known as the *Interim*, opposed the conciliatory measures of Melancthon, and established himself at Magdeburg at the head of a party of rigid Lutherans. In 1558 he was appointed professor of theology in the newly founded university of Jena, and engaged in a violent dispute with Strigel concerning hereditary sin and the synergetic power of the human will, which resulted in his being deposed. He retired to Ratisbon, and afterward preached in several German cities. He was one of the most prominent of the reformers, and besides producing numerous polemical writings, distinguished for their severity, was the originator and one of the principal authors of the famous "Centuries of Magdeburg."

FLAG. 1. The common name of a large family of the lowest order of plants, known as *algæ*. These *algæ* have all flagging habits, like the common seaweeds, which are usually fixed to

rocks by their roots, while their branches are borne up by the tides, falling again and lying in confused masses one upon another at its recess. The propriety of this homely term is better seen in the *ulva* or laver, of which *ulva latissima*, very common on the American

batracho-spermum moniliforme (Roth.), with very delicate, branching filaments, composed of violet-colored beads, and having a plummy, flagging aspect. So the *confervee*, resembling confused and tangled skeins of silk, have the same appearance; and even in the more highly

Ulva latissima.

coast, having a broad, ovate or oblong, undulated, bright green frond, may be seen lying on the soft ooze at low tide, and floating near the bottom at high water. *Enteromorpha*, with tubular, membranaceous, green, netted fronds, is still more flaccid, and is easily collected from rocks and beaches, when thrown up by the winds. A rich, dark purple kind

Porphyra vulgaris.

developed bright crimson and red kinds, or in the fuscous and inelegant *fuci*, and in the larger forms, equalling in size trees and shrubs, the name of flags is not an inapt one. II. Besides these lower plants, the name of flag is given to the iris family, which bear conspicuous flowers, some of great splendor. (See ILL.) III. The sword flags are stiff, erect, very

Enteromorpha electa.

(*porphyra vulgaris*, Agardh) may be frequently noticed on the piles and posts of wharves, hanging loosely down, like broad shreds, growing also on rocks between high and low water mark. Even in fresh water, in running streams, the flags are to be met with, such as

Fucus vesiculosus.

long-leaved plants, with spikes of extremely showy purple, scarlet, rosy, or white blossoms, and with large flat tubers (*corms*), requiring heat, moisture, and sunshine while growing, but entire rest and dryness when dormant. Natives of the Cape of Good Hope, few gar-

den flowers exceed them in gorgeousness or beauty, and few require so little care. The Belgian florists have succeeded in raising many splendid hybrids and varieties, of every hue; and the flower catalogues afford the names of the choicest of these, which command high prices. *Gladiolus communis* is hardy enough to survive our winters; it is a slender-growing species, with pretty purplish or crimson blossoms, and this and one or two others found in the south of Europe are exceptional; the rest are natives of the hot regions, particularly of the Cape. The *ixias* are smaller, dwarf irids or flags, with open, showy blossoms upon spikes, and variously colored. They are finely suited for winter flowering in greenhouses; their bulbs or *corms* are planted early in the autumn; the plants, on rising from the soil, are exposed to the air and light, and on approach of frost placed just beneath the sashes of the roof, where they blossom toward spring. These also require extremes of treatment, being kept perfectly dry and warm when in repose.

FLAG (from a root signifying to hang down or droop, kindred with Lat. *flaccus*, flabby, or drooping), a piece of stuff or cloth intended to be displayed so as to indicate, by shape, color, or symbols, nationality, rank, party, or opinion. In common speech the word is synonymous with standard, banner, ensign, or colors. The most ancient standards were probably symbols borne upon a pole. Among the Egyptians each battalion had a distinguishing emblem representing some sacred object, such as an animal or bird, or a tablet bearing a king's name or other device. The Assyrians, according to the Ninevite sculptures, had two standards, one a figure of a man standing upon a running bull and drawing a bow, the other two bulls running in opposite directions. They are supposed to have been the symbols respectively of peace and of war. The Persians in the time of Cyrus adopted a white flag with a golden eagle displayed for their standard. The Greeks bore divers symbols: sometimes a piece of armor elevated upon a spear, sometimes the emblem of a divinity, sometimes an initial letter. According to Homer, Agamemnon used a purple veil to rally his men. The Romans had many standards. In the most primitive times each company bore a bundle of hay tied to a pole. Afterward the figure of an open hand, a wolf, a bear, a horse, or other animal, was substituted. In the time of Marius a silver eagle, with expanded wings and holding the thunderbolts of Jove in its talons, was adopted as the standard of the legion. The different eagles, white, black, and red, with single or with double heads, borne by countries of modern Europe, are imitations of this. The Roman standards changed with their conquests, and succeeding emperors displayed new forms and new emblems. Augustus used a globe to symbolize his empire over the world, and Constantine adopted the cross to commemorate his vision. (See **LABARUM**.)

Standards are mentioned frequently in the Bible. The Hebrews who went up out of Egypt were marshalled under distinctive banners. According to tradition, the four leading tribes, Reuben, Ephraim, Judah, and Dan, bore as devices respectively a man, an ox, a lion, and an eagle. From the most ancient times the dragon has been the chief symbol of China, Japan, and other eastern nations. It was also a prominent device among the Celtic, Germanic, Scandinavian, and Slavic tribes. At first, like many other emblems used for standards, it was of metal or carved wood, but in time was displayed upon a banner. It was the device on the banner of Harold at the battle of Hastings, and was borne by several other English monarchs.—The earliest flags proper were probably square cloths of a single color; but as nations multiplied parti-colors and different combinations were adopted to secure variety, and finally the devices or bearings of chieftains or of tribes were added. In modern times flags of a single color have generally a universally accepted meaning: thus, a white flag is a token of peace, a red of defiance; a black flag denotes piracy, or is sometimes hoisted to indicate that no quarter will be given or taken; a yellow denotes quarantine. Ancient standards were of many shapes, some square, some long and pointed, some swallow-tailed, and some ending in many points. The banner which Charlemagne received from the pope was oblong and split into three points; the oriflamme of France was of the same shape with five points. The standards of Henry VIII. of England were long pointed streamers rather than flags. Nearly all the standards and ensigns of modern nations are rectangular, but there are some exceptions. The naval flag of Sweden has three points, that of Denmark two, and the flag of China is triangular. Some of the principal European nations have each two or more flags, a royal or imperial standard, a national ensign, a naval ensign, and a flag for merchantmen. Royal and imperial standards are never hoisted except on occasions of great ceremony, when the sovereign or some member of the royal family is present, or on the sovereign's birthdays.—The royal standard of Great Britain displays the heraldic insignia of England, Scotland, and Ireland, quartered, the field of the first and fourth quarters red, the second yellow, and the third blue. The national flag, called the "union jack," is blue, charged with the three crosses of St. George, St. Andrew, and St. Patrick. The cross of St. George is red on a white field, of St. Andrew a white saltier (diagonal cross) on a blue field, and of St. Patrick a red saltier on a white field. The union jack adopted by James I. in 1606 combined only the first two, but on the union with Ireland in 1800 the cross of St. Patrick was added. This is the union jack which forms the canton in the British naval and commercial flags. The word jack is derived by some from the jacque or surcoat charged with St. George's cross,

worn in the crusades by English soldiers, which name became in time transferred to the cross itself, and finally to the flag bearing the cross. Others derive it from *Jac.*, the abbreviation of *Jacobus*, the Latin form of James.—In the 12th century the standard of France was white, sprinkled with golden fleurs de lis. Henry IV., the founder of the house of Bourbon, adopted the white flag charged with the escutcheon of his family, three golden fleurs de lis on a blue shield. This is the flag contended for so earnestly by the count de Chambord. It was succeeded early in the revolution by the tricolor, which was constituted the national standard by law in 1792. This is generally said to be the union of the blue banner of St. Martin, the red oriflamme of St. Denis, and the *cornette blanche* which succeeded the latter; but it is probable that its adoption was accidental. The red and blue, the colors of the city of Paris, were chosen first, and the white of the royal standard was added afterward. When this flag was first displayed there was no accord in the arrangement of the colors, and the stripes were sometimes placed horizontally instead of vertically. The present mode was prescribed finally by law. Napoleon adopted for the imperial standard the tricolor sprinkled with golden bees and charged with the eagle of France. At the restoration the white flag returned with royalty. The hundred days brought back the tricolor, but the white flag again succeeded it in 1815, and on April 18, 1816, it was decreed to be the national standard of France. The revolution of 1830 restored the tricolor, and it has since remained the national flag.—The imperial standard of Germany is white charged with a black cross, with the black eagle of the empire at its intersection. In the dexter canton is the cross of Prussia on a black, white, and red field. The Russian imperial standard is yellow charged with the double-headed eagle of Constantine the Great, symbolical of the Eastern and Western empires. This emblem was adopted by Ivan I. on his marriage with a princess of the Greek imperial house. On the breast of the eagle, which is black, are emblazoned the ancient arms of Russia, St. George and the dragon, on a red field, now the arms of the city of Moscow. The imperial standard of Austria is yellow also, charged with the double-headed eagle of the Roman empire, but it has an indented border of gold, silver, blue, and black. The Austro-Hungarian national ensign is formed of three equal horizontal bars, the chief red, the middle white, and the base red in the dexter half and green on the fly. The green is added for Hungary, the national colors of which are red, white, and green. The middle bar displays a shield, charged with red, white, and red, surmounted by the imperial crown. The royal standard of Italy is green, white, and red, in equal vertical bars, the red to the fly; on the white are the arms of Savoy surmounted by the crown. The royal standard of Spain in the time of Ferdinand and Isabella

displayed the arms of Castile, Leon, Aragon, the Two Sicilies, and Granada. Under the Bourbons it combined the arms of Castile, Leon, Granada, and the fleurs de lis of Bourbon. The standard fell with the monarchy, and in December, 1873, the republic ordered the removal from the naval ensign of the royal insignia. The royal standard of Portugal is red, charged with the arms and crown. The royal standard of the Netherlands is the same as the merchant flag, with the royal arms on the white bar. The Belgian royal standard is the same as the ensign, with the arms on the yellow division. The ensigns of Sweden and Norway are formed of the united flags of the two countries. The flag of Sweden is blue with a yellow cross, that of Norway red with a blue cross. The two, combined in the manner of the union jack of Great Britain, are cantoned in the national ensigns. The Danish merchant flag is the same in color and device as the naval ensign, but is rectangular. The same remark applies to the merchant flag of Sweden. The commercial flag of Greece is the same as the naval, omitting the crown on the cross. The royal standard of Greece is blue charged with a white cross, the canton of the ensign. The crescent and star of Turkey was the device of Diana Byzantina, the patroness of Byzantium, and was hoisted first by Mohammed II., after the capture of Constantinople.—The English colonies in America displayed at first the flag of the mother country, the cross of St. George. In 1636 Endicott, the Puritan governor of Massachusetts, cut the cross out of the banner to show his hatred of Romanism. In 1637 the king's arms were substituted for the obnoxious emblem; but in 1651, the parliament of the commonwealth having revived the old standard of St. George, it was ordered by the general court to be used on all necessary occasions. Various modifications were in use at different times. Sometimes the field was white charged with the cross, sometimes red with the cross cantoned on a white field, and sometimes blue with the cross similarly cantoned; and occasionally a globe or a pine tree was depicted in the upper canton formed by the cross. The flag of New England under Sir Edmund Andros was white charged with St. George's cross, bearing in the centre the letters *J. R.* (*Jacobus Rex*) surmounted by the crown. In 1707 the union jack of King James was adopted, and distinctive colonial flags probably went out of use. In the beginning of the revolution a variety of flags were displayed in the revolted colonies. The "union flags" mentioned so frequently in the newspapers of 1774 were the ordinary English red ensigns bearing the union jack. These generally bore some patriotic motto, such as "Liberty," "Liberty and Property," "Liberty and Union," &c. After the battle of Lexington the Connecticut troops displayed on their standards the arms of the colony with the motto *Qui transtulit sustinet*; and later, by act of the provincial congress, the regiments were distinguished by the colors of

FLAGS OF THE PRINCIPAL NATIONS.



GR. BRIT., NAVAL.



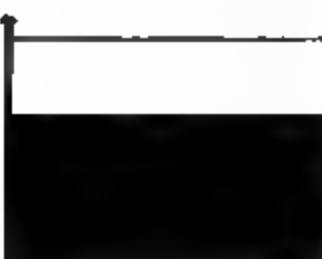
GERMANY, NAVAL.



GERMANY, MERCHANT.



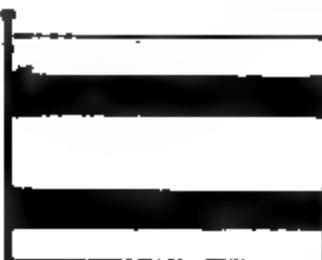
RUSSIA, NAVAL.



RUSSIA, MERCHANT.



SPAIN, NAVAL.



SPAIN, MERCHANT.



NETHERLANDS.



DENMARK, NAVAL.



GREECE, NAVAL.



TURKEY, MERCHANT.



EGYPT.



PERSIA.



JAPAN.

F

PRINCIPAL NATIONS.



CHINA.



U. S. or COLOMBIA.



BOLIVIA.



URUGUAY.

FLAGS OF THE AMERICAN REVOLUTION.



PINE TREE FLAG.



NAVAL FLAG of 1776.



RATTLESNAKE FLAG.



GRAND UNION FLAG
OF 1778.



FLAG of 1777.

FLAGS OF THE CONFEDERATE STATES OF AMERICA.



CONFEDERATE FLAG
OF 1861.



CONFEDERATE
BATTLE FLAG.



CONFEDERATE FLAG
OF 1862.



CONFEDERATE FLAG
OF 1864.

their flags, as, for the 7th blue, for the 8th orange, &c. The early armed ships of New York are said to have displayed a beaver, the device of the seal of New Netherland, on their ensigns. It is uncertain what flag, if any, was used by the Americans at Bunker Hill. That displayed by Putnam on Prospect hill on July 18 following was red, with *Qui transtulit sustinet* on one side, and on the other, "An Appeal to Heaven." This last motto was adopted, April 29, 1776, by the provincial congress of Massachusetts as the one to be borne on the flag of the cruisers of that colony, "a white flag with a green pine tree." What flag Arnold carried in the expedition to Canada is not known. The first armed vessels commissioned by Washington sailed under the pine-tree flag. The first republican flag unfurled in the southern states, blue with a white crescent in the upper corner next to the staff, was designed by Col. William Moultrie of Charleston, at the request of the council of safety, and was hoisted on the fortifications of that city in September, 1775. The flag displayed on the E. bastion of Fort Sullivan, afterward called Moultrie, on June 28, 1776, was the same, with the word "Liberty" on it. On the W. bastion waved the flag called the "great union," first raised by Washington at Cambridge, Jan. 2, 1776. This consisted of the 13 alternate red and white stripes of the present flag of the United States, with the crosses of St. George and St. Andrew emblazoned on the blue canton in place of the stars. This flag was carried also by the fleet under command of Commodore Esek Hopkins, when it sailed from the Delaware capes, Feb. 17, 1776. Hopkins had displayed previously a yellow ensign bearing the device of a rattlesnake in the attitude of striking, with the motto "Don't tread on me." This emblem was suggested probably by the cuts displayed at the head of many newspapers of the time, which represented a snake divided into 13 parts, each bearing the abbreviation of a colony, with the motto beneath, "Join or Die," typifying the necessity of union. The snake was represented generally with 13 rattles; sometimes it was coiled around the pine tree at its base, and sometimes depicted at length on a field of 13 alternate red and white or red and blue stripes. The official origin of the "grand union" flag is involved in obscurity. At the time of its adoption at Cambridge the colonies still acknowledged the legal rights of the mother country, and therefore retained the blended crosses of St. George and St. Andrew, changing only the field of the old ensign for the 13 stripes emblematic of their union. The colors of the stripes may have been suggested by the red flag of the army and the white one of the navy, previously in use. These 13 stripes are supposed to have been used first on a banner presented in 1774 or 1775 to the Philadelphia troop of light horse by Capt. Abraham Markoe, and still in the possession of that troop. After the decla-

ration of independence the emblems of British union became inappropriate, but they were retained in the flag until the following year. Congress resolved on June 14, 1777, "that the flag of the 13 United States be 13 stripes alternate red and white; that the union be 13 stars, white in a blue field, representing a new constellation." This is the first recorded legislative action for the adoption of a national flag. The resolution was not promulgated officially until Sept. 8, although the newspapers published it a month earlier. It is supposed that the flag was unfurled first by Paul Jones on the Ranger, to the command of which he was appointed on the same day that the resolution regarding the flag was passed. It is not known by whom the stars were suggested. By some they have been ascribed to John Adams, and by others it has been urged that the entire flag was borrowed from the coat of arms of the Washington family; but both conjectures are without proof, and the latter is improbable. The 13 stars of the flag of 1777 were arranged in a circle, although no form was prescribed officially. The flag thus adopted remained unchanged till 1794, when, on motion of Senator Bradley of Vermont, which state, with Kentucky, had been admitted into the Union, it was resolved that from and after May 1, 1795, "the flag of the United States be 15 stripes alternate red and white, that the union be 15 stars, white in a blue field." This was the flag used in the war of 1812-'14. The act made no provision for future alterations, and none were made till 1818, although several new states had meanwhile been admitted into the union. In 1816, on the admission of Indiana, a committee was appointed "to inquire into the expediency of altering the flag." A bill was reported, Jan. 2, 1817, but was not acted on, which embodied the suggestions of Capt. Samuel O. Reid, distinguished for his defence of the brig General Armstrong against a superior British force in Fayal roads in 1814, who recommended the reduction of the stripes to the original 13, and the adoption of stars equal to the number of the states, formed into one large star, and a new star to be added on the 4th of July next succeeding the admission of each new state. On April 4, 1818, a bill embodying these suggestions, with the exception of that designating the manner of arranging the stars, was approved by the president, and on the 18th of the same month the flag thus established was hoisted on the hall of representatives at Washington, although its legal existence did not begin until the following 4th of July. In 1859, when congress passed a vote of thanks to Capt. Reid, the designer of the flag, it was suggested that the mode of arrangement of the stars should be prescribed by law, but the matter was overlooked. The stars in the unions of flags used by the war department of the government are generally arranged in one large star; in the navy flags they are invariably set in parallel lines. The blue union, which now contains 37

stars, when used separately is called the union jack. The United States revenue flag, adopted in 1799, consists of 16 perpendicular stripes, alternately red and white, the union white with the national arms in dark blue. The union used separately constitutes the revenue jack. The American yacht flag is like the national flag, with the exception of the union, which displays a white foul anchor in a circle of 13 stars in the blue field.—During the civil war the several seceded states used at first distinctive state flags. In March, 1861, the confederate congress adopted the so-called "stars and bars," composed of three horizontal bars of equal width, the middle one white, the others red, with a blue union containing nine white stars arranged in a circle. The resemblance of this to the "stars and stripes" led to confusion and mistakes in the field; and in September, 1861, a battle flag was adopted, a red field charged with a blue saltier, with a narrow border of white, on which were displayed 13 white stars. In 1863 the "stars and bars" was supplanted by a flag with a white field having the battle flag for a union. The flag of 1863 was found deficient in service, it being liable to be mistaken for a flag of truce; and on Feb. 4, 1865, the outer half of the field beyond the union was covered with a vertical red bar. This was the last flag of the confederacy.—See "Origin and Progress of the Flag of the United States of America," by George Henry Preble, U. S. N. (8vo, Albany, 1872).

FLAGELLANTS (Lat. *flagellare*, to scourge), a name given during the middle ages to various societies of penitents, who went about scourging themselves in public. The first organization of this kind arose in 1056, and was due to St. Peter Damian; and his efforts were crowned with such success that persons were everywhere seen scourging and lacerating themselves to appease the wrath of heaven. This practice, though discountenanced by the ecclesiastical authorities, became more and more prevalent. In 1260 the calamities consequent upon the long wars between Guelphs and Ghibellines impressed the popular mind with the belief that the end of the world was at hand, and a guild of flagellants was founded in Perugia by one Rainier, a Dominican friar. A branch society was soon after established in Rome, and thence rapidly spread throughout Italy. Vast bodies of men, girded with ropes, marched in procession through the streets, and from city to city, singing lugubrious chants, scourging their naked shoulders, and calling on the people to repent. All hostilities ceased; and the effect of this display, though not lasting, was at first irresistible. Such processions spread from Italy to other countries. In 1261 large numbers of flagellants were to be seen in Austria, Hungary, and Poland, scourging themselves publicly during 33 days in memory of the 33 years of Christ's life upon earth. These displays were repressed for the time by the civil magistrates; but they recommenced on a

larger scale about 1349, when all Europe had been desolated by the "black death." The flagellants now proclaimed that Christ was about to come back on earth, that the world was to be purified by the baptism of blood, and that flagellation was to be the sole sacrament of this new era. These fanatics spread all over Europe, and a band of 120 reached London in the time of Edward III., but found no sympathy among the English people. On the continent women and boys joined in these processions. But to the excesses which characterized their devotion were soon added disorders of every kind. In several places they excited the populace to rise against the Jews, whom they represented as the cause of the "black death." In 1349 Pope Clement VI. issued a bull against them, and in 1372 they were denounced as heretics by Gregory XI. Early in the 15th century they reappeared in Germany; but their leader, Conrad Schmidt, was burned as a heretic in 1414. In France the celebrated Gerson wrote against them in the name of the university of Paris, and a royal edict forbade their processions. In Italy and Spain some good men, like Vincent Ferrer, endeavored to encourage the practice of public flagellation, while restraining every excess and disorder; but after the council of Constance the flagellants disappeared from European history.—The name of flagellants was also given to some pious guilds in Catholic countries, approved by the ecclesiastical authorities, but which are now almost entirely extinct. In southern France they existed under the name of the white flagellants (*blancs battus*) down to the reign of Henry III., who established a branch of them in Paris, and joined them, with several of his most licentious courtiers. This effectually extinguished them.—See Muratori, *Antiquitates Italicae Medii Aevi*; and especially Förstemann, *Die christlichen Geislergesellschaften*.

FLAGG. I. George Whiting, an American artist, born in New Haven, Conn., June 26, 1816. His boyhood was passed in Charleston, S. C., where his juvenile portrait of Bishop England excited much injudicious admiration. He soon became a pupil of his uncle, Washington Allston, whose instruction he enjoyed for two or three years. The pictures "A Boy listening to a Ghost Story," "A Young Greek," and "Jacob and Rachel at the Well," were painted at this time. A picture of the "Murder of the Princes," from "Richard III.," procured him the patronage of Luman Read of New York, through whose assistance he visited Europe and spent three years in study. He resided for six years in London, where he painted portraits principally, but executed also a few *genre* pictures, among which the "Match Girl," "Haidee," and the "Scarlet Letter" received the most approbation. After his return he opened a studio in New Haven and painted a number of historical pictures, the chief of which are "The Landing of the Pilgrims," "The Land-

ing of the Atlantic Cable," and "Washington receiving his Mother's Blessing." Mr. Flagg has suffered much from ill health, and his efforts have been in consequence unequal. II. **Jared Bradley**, an American artist and clergyman, brother of the preceding, born in New Haven, Conn., June 16, 1820. He studied for a short time with his brother, and had some instruction also from Washington Allston. When but 16 years old he exhibited in the national academy a portrait of his father. He settled in Hartford, where he painted many portraits and a few other pictures. In 1849 he removed to New York, and the following year the exhibition of his "Angelo and Isabella" from "Measure for Measure" secured his election as an academician. He afterward studied theology, and in 1854 was ordained deacon in the Episcopal church. Since then he has been pastor of several churches, and has found time also to paint many pictures.

FLAHAUT DE LA BILLARDERIE. I. **Auguste Charles Joseph**, count, a French general and diplomatist, born in Paris, April 21, 1785, died there, Sept. 2, 1870. His father succeeded Buffon as director of the *jardin des plantes*, and was executed by the revolutionists. The property of his widow was confiscated. In 1800 Flahaut joined the army in Italy, became successively aide-de-camp of Murat, Berthier, and Napoleon, fought in Portugal, Russia, and Germany, and gained particular distinction at the battle of Leipsic, on which occasion he was made general of division, with the title of count. During the hundred days he was created a peer, and took part in the battle of Waterloo. After the revolution of 1830 he was reinstated in his rank and title. In 1831 he was for a short time ambassador in Berlin, and officiated in the same capacity in Vienna from 1841 to 1848. On the *coup d'état* of Dec. 2, 1851, he became a member of the consultative commission, in 1853 senator, in 1854 a member of the commission to collect the correspondence of Napoleon I., and in 1860 ambassador to London. He married on July 28, 1817, Margaret Mercer Elphinstone, who succeeded to the peerages of the United Kingdom and Ireland as Baroness Keith in 1823, and to the Scottish barony of Nairn in 1838. The saloon of Mme. de Flahaut was a favorite resort of eminent politicians. The count was one of the intimate friends of Louis Napoleon's mother, Queen Hortense, who is said to have composed for him her popular air *Partant pour la Syrie*; and he was believed to have been the father of M. de Morny. II. **Adèle Filieul**, a French authoress, mother of the preceding, born in the château of Longpré in Normandy, May 14, 1761, died in Paris, April 16, 1836. Her second husband was the marquis José Maria de Souza Botelho (born in Oporto, March 9, 1758, died in Paris, June 1, 1825), who was for some time Portuguese ambassador in Paris, and who prepared a valuable edition of Camoens's "Lusiad." Her first and best work, *Adèle*

de Sénangea, ou Lettres de Lord Sydenham, appeared in London in 1794, with a preface by the marquis de Montesquiou. It was followed in 1799 by *Emilie et Alphonse*, and by a series of other works, a complete edition of which appeared in Paris in 1821-'2 (6 vols. 8vo and 12 vols. 12mo). A charming representation of the best French society in the 18th century is found in her writings.

FLAMBOROUGH HEAD, a promontory on the coast of Yorkshire, England, in lat. $54^{\circ} 7' N.$, lon. $0^{\circ} 5' W.$ It is a range of steep and in some places perpendicular chalk cliffs, some of which rise to a height of 450 ft. On the headland stands a lighthouse 214 ft. above the sea, with a revolving light visible at a distance of 30 m. The cliffs are perforated by numerous caverns, which during the summer are resorted to by immense numbers of sea fowl. The ruins of an ancient tower and a Danish intrenchment are on the summit, and Flamborough village stands near the centre of the promontory.

FLAME, the luminous appearance caused by the combustion of gases or vapors. When a liquid or solid is burned so as to form a flame, it is first converted into gas or vapor. The small blue flame which appears upon burning charcoal is caused by the union of atmospheric oxygen with the carbonic oxide gas which is

the first product of the union of oxygen with carbon. The structure of a flame is best observed in the burning of a sperm or tallow candle, or an oil lamp having a solid wick. In the candle flame, represented in section in fig. 1, the central dark inner cone *a*, surrounding the wick and proceeding to a point a short distance above it, is chiefly composed of light and heavy carburetted hydrogen gases, formed by the action of heat on the melted fat, and such as are contained in common illumina-



FIG. 1.

ting gas, of nitrogen obtained from the air, of watery vapor, and also of carbonic oxide and carbonic acid gases. In the blue zone, *b*, at the base of the flame, the gas of the base of the inner cone is completely burned by oxygen less rarefied than that which reaches other parts of the flame. This zone has the same character as the inner flame of the blowpipe. That part of the flame which furnishes the principal part of its light is called the luminous cone, represented at *c*. Its base surrounds the inner cone, its apex reaching above it. It is luminous in consequence of the incandescence of numerous minute particles of solid carbon which have been formed by the abstraction of the constituent hydrogen of the carbo-hydrogen gas, and its union with atmospheric oxygen. The supply of oxygen to the inner parts of this flame is not sufficient to consume the carbon, but the combustion of hydrogen furnishes sufficient heat to produce white light in

the particles of solid carbon. The combustion is completed in the outer cone, *d*, by the union of carbon and remaining unconsumed gases, with atmospheric oxygen. It is called the mantle, and is much less luminous than the cone last described, the light being principally caused by incandescent gas and vapor. This part of the flame is sometimes confounded with the blue zone at the base, but the mistake can readily be demonstrated by holding a piece of cardboard between the eye and the flame in such a way as to cut off the luminous cone, and thus enable the difference in the character of the light of the two cones in question to be distinguished. The flame of a lamp wick is of course similar to that of a candle; and a flat flame has the same structure, only the part corresponding to the inner cone is very thin. The blue-colored parts of an ordinary flame are chiefly owing to the combustion of carbonic oxide gas, which may be considered as the transition state of the carbon element during its complete union with atmospheric oxygen and formation of carbonic acid. The upward current of heated gas produced by a flame burning in air, undisturbed by external currents, is quite rapid, as may be observed when smoke is allowed to be carried up with it, and the resistance which it offers to horizontal currents is considerable.—The structure and composition of a candle flame may be demonstrated in several ways. If a fine metallic wire is passed horizontally through the centre, it will soon become incandescent in the luminous cone and mantle on each side of the flame, while that part which is in the dark inner cone will slowly become only slightly red from conduction of heat, or not at all if the wire is very small. If the wire is of steel or iron, after being held for some time in the flame it will be found on examination to have become corroded at those points which were in the mantle and outer part of the luminous cone, in consequence of combining with atmospheric oxygen, which it readily does under the influence of incandescent heat. That part of the wire which is in the inner cone will not be affected, while that part which is in the inner part of the luminous cone will be covered with lampblack. If a silver or copper wire which has had the surface tarnished by oxygen be employed, the tarnish will disappear at those points which are in the inner part of the luminous flame, because the oxygen which had united with the metal is now taken up by the heated free carbon in the flame. In the outer cone or mantle the coating of oxide will be increased. This furnishes an explanation of the nature of the common or mouth blowpipe flame, which is produced by blowing a fine stream of air through the flame of an oil or alcohol lamp or a candle, fig. 2. The tip of the blowpipe is usually introduced into the inner cone, and air from the mouth is forced through it, which mingles atmospheric oxygen with the combustible gases, and produces complete combustion

of all those portions in the line of the jet. The whole flame is directed by the current of the jet, and a current of air surrounding it also passes in the same direction. The whole of the gases of the inner cone are not consumed by the air blown through the pipe (unless it be

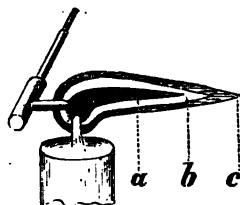


FIG. 2.



FIG. 3.

too large), but a portion is left to be consumed in the luminous outer hollow cone, *c*, where it meets with the oxygen of the air. As the oxides of metals are reduced to a metallic state by parting with oxygen to the carbon, the inner flame *a* is called the reducing flame, and its point *b* is also the hottest point in the whole flame. The outer cone is the oxidizing flame, which varies in quality in different portions, the most effective point for most purposes of oxidation being at the tip, although the flame is used in a variety of ways, depending upon the material under examination and the nature of the substance in which it is held. If a piece of fine wire gauze is held in a horizontal position and lowered into the flame, the latter will only continue to burn below it, the unconsumed gases passing through, but without sufficient heat to burn. A central dark circle, a section of the inner cone, will then be observed, and also a luminous outer ring, formed of the luminous cone and the mantle. (See fig. 3.) If, while the gauze is held in the flame, a lighted taper be applied to the upper surface, the unconsumed gas will take fire, and the original flame will be nearly restored, the gauze forming a horizontal section. If the flame be extinguished by the breath, and while the wick is smoking the gauze be quickly placed a short distance above it, and a lighted taper applied to the upper side, the ascending combustible gases which still issue from the wick and pass through the gauze will take fire, producing a flame above it, which will not extend beneath because the gauze conducts away the heat sufficiently to prevent ignition of the column of gas below. This phenomenon, however, will only last a moment, as the wick soon ceases, in the absence of heat, to furnish combustible gases. The experiment can be better made over a jet of common illuminating gas. (See fig. 4.) The flame above the gauze will not be so distinctly divided nor so luminous as in an entire flame, because of the partial mix-

ture of oxygen with the combustible gases before passing through the gauze.—If one end of a small glass or metal tube, open at both ends, be introduced into the inner cone of a candle flame, and the other end elevated and a lighted taper applied to it, a second flame will be pro-

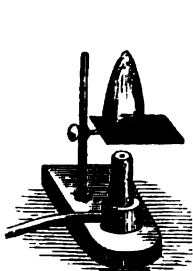


FIG. 4.



FIG. 5.

duced from the combustible gases which have been conveyed off by the tube. (See fig. 5.) It is by the use of such a tube, only longer, and bent so as to pass under water and into collecting vessels, that the gases are collected for analysis. Bunsen's burner, fig. 6, furnishes an



FIG. 6.

example of the effect of a free and full supply of oxygen to a burning gas. The carbon being consumed almost simultaneously with its hydrogen constituent, scarcely any separation of solid particles occurs, and therefore there is but little light other than that produced by the incandescent gases and vapors. Conversely, the luminosity of a flame may be increased by the addition of substances rich in carbon. If hydrogen gas or light carburetted hydrogen be

passed through naphtha or benzole, its flame may be rendered highly luminous. So also the addition of a substance, as chlorine gas, which has the power of abstracting the constituent hydrogen from a carbo-hydrogen gas and setting free the carbon, will increase the luminosity of a flame.—Increase and diminution of pressure have been found by Frankland to have a remarkable influence upon the luminosity of flames. On the summit of Mont Blanc candles burn with a feeble light, and in artificially rarefied air it has been found that the brightness of ordinary flames increases or diminishes in proportion to the increase or diminution of pressure, down to that which supports a column of mercury of 14 inches. Below this pressure the luminosity diminishes at a less rate than the pressure. Under increased pressure a

flame fed with amyl alcohol was found to increase in direct proportion to the pressure till it was equal to two atmospheres, and beyond this the light increased more rapidly than the pressure. The increase of light is caused by the greater separation of carbon particles under increased pressure, the incandescence of which is the cause of the light. Under a pressure of two atmospheres candle flames evolve much smoke; and the flame of alcohol, which is ordinarily very pale, becomes highly luminous under a pressure of four atmospheres. Conversely, flames which smoke in an ordinary atmosphere cease to do so in a rarefied one, the combustion being more complete in consequence of the greater mobility of the gaseous particles. The reason why the luminosity of flames in very rare atmospheres does not decrease in exact proportion to diminution of pressure is that the incandescent carbon does not furnish all the light; the remainder, which amounts to about 1 per cent. under ordinary circumstances, being produced by incandescent gas, and not being affected by pressure, adding a greater proportional fraction to the amount.—Singing flames were partially investigated by De la Rive in 1802. A small quantity of water heated in the bulb of a thermometer produced musical sounds by the periodic expansion and condensation of vapor in the tube; and he referred the singing of ordinary gas flames in tubes to a similar expansion and condensation of the aqueous vapor formed by the combustion. Faraday, however, in 1818 showed that flames which did not produce water in burning, such as that of carbonic oxide gas, would produce musical sounds; and that they would also occur in ordinary flames when the surrounding air was raised above 212° F., so that no condensation of vapor could take place. Experiments in which flames are subjected to the influence of acoustic vibrations producing musical tones show conclusively that the notes produced by them are not of that independent character which would result from expansion and condensation of vapor, but that they have an intimate relation with the principles of harmony. The influence which the length and calibre of the tube in which the combustion takes place, being precisely of the same kind as that exerted on a jet of air blown into an organ pipe, and the sensitive manner in which flames respond to certain musical tones (as has been beautifully illustrated in experiments by Tyndall), indicate their relation to and dependence upon the acoustic vibrations which produce these tones. This subject, and also that of König's sensitive manometric flames, which pulsate on receiving musical vibrations under circumstances in which they indicate by their forms the nature of the sounds, will be treated of in the article Sound.

FLAMEL, Nicolas, a French scribe and reputed alchemist, born about 1330, died in Paris, March 22, 1418. He combined the occupations of copyist and bookseller, married Pernelle, a

widow of some property, and also received pupils in his house, to whom he taught writing and the rudiments of letters. The means which he thus acquired were profitably invested, and the products of his industry and rents enabled him to build hospitals and free lodging houses, found chapels, and endow churches, which he often adorned with paintings and sculptures, especially with bass reliefs of himself and his wife. His fame increased after his death, and the attempt to account for a fortune which had been magnified by popular credulity resulted in attributing to him the possession of the philosopher's stone. In 1561 the *Sommaire philosophique*, a metrical treatise on alchemy, was published probably by Gohorry, under the name of Flamel; and it completely established his reputation as an alchemist till Vilain critically investigated his history (1761). It has been conjectured that the Jews, who were then much persecuted in France, made him the depositary of their wealth; or, which is still more improbable, that the cabalistic book of *Habraham Juif*, which he is said to have studied, contained emblematic signs of the various places where the Jews, expelled from the kingdom, had buried their treasures.

FLAMEN, in Roman antiquity, a member of an ancient college of priests, established by Numa, each of whom was confined to the service of a particular deity. The original three, the *dialis*, *martialis*, and *quirinalis*, consecrated to Jupiter, Mars, and the deified Romulus, were afterward distinguished as *maiores*, and chosen from a select class of the patrician order (see **CONFARRIGATION**); while the later 12, called *minores*, were elected from the plebeians. Their dignity was for life, but could be forfeited by neglect of duty, or lost in consequence of an ill-omened event disturbing any of their sacred performances. Their official dress was the *apex*, a cap either conical or close-fitting, having at the top a pointed piece of olive wood, surrounded at its base by a lock of wool (*flum*, whence, according to some, their name, while Plutarch derives it from *pileum*, hat), the *lana*, or mantle, and the laurel wreath. The most distinguished member of this college of priests was the *dialis*, honored with the privileges of a seat in the senate, the *toga prætexta*, a lictor, and the higher prerogative of procuring pardon or respite for criminals who came to him for refuge; but he was also burdened by several restrictions, being forbidden, for instance, to leave the city even for a single night, to swear an oath, to wear a ring, to ride or touch a horse, and to remarry after the death of his wife, who assisted him in the performance of some of his sacred functions, and was called *flaminica*. In later times the deified emperors of Rome had particular flamens appointed to their worship.

FLAMINGO, a wading bird of the order *natares*, family *anatida*, subfamily *phænicopterina*, and genus *phænicopterus* (Linn.). The bill is longer than the head, high at the base, com-

pressed, suddenly bent at a right angle in the middle, the sides growing narrower, and rather obtuse at the tip; the lateral margins are incurved and finely laminated; the base to around and behind the eye is covered with a soft and delicate skin, finer than the finest kid, the end being corneous; the nostrils are near the base, linear, $1\frac{1}{2}$ in. long; length about 5 in.; beyond the curve the color is black, the base being orange and yellow. The wings are moderate, with the first and second quills nearly equal and longest; the tail is 6 in. long; the tibia is lengthened and naked; the tarsi are very long and slender, and both covered by transverse scales; the toes are short, the anterior ones united by a membranous web; the hind toe is very short, almost touching the ground, and free; the claws are short and flat. There are five or six species, inhabiting the warmer parts of the globe, frequenting the seashore and marshes in considerable flocks; one acts as sentinel while the rest are feeding or resting, and on the approach of danger gives the alarm by a trumpet-like noise, and starts off leading all the rest; they fly either in triangular lines like the wild goose, or in Indian file when they are about to alight; they can run quickly, but when walking are said to assist themselves by placing the upper mandible on the ground; though web-footed, they do not swim, the webs serving to support them in wading over soft mud. The food consists of mollusks, crustaceans, fish spawn, marine insects, and small fish; the singular form of their bill enables them, by turning it toward the body, to place the upper mandible downward, and thus to collect their food as in the bowl of a spoon. The small head, angular bill, long and slender neck, stilt-

American Flamingo (*Phænicopterus ruber*).

like legs, comparatively small body, and brilliant colors render the flamingo one of the most extraordinary forms among birds.—The American flamingo (*P. ruber*, Linn.) is about 4 ft. long from bill to end of tail, and $5\frac{1}{2}$ ft. to end of claws; the extent of wings is $5\frac{1}{2}$ ft.,

that of each wing being $16\frac{1}{2}$ in.; the tarsus $12\frac{1}{2}$ in.; bill along gape 5 in., along the curve 6 in.; middle toe $8\frac{1}{2}$ in.; the circumference of the body is only 24 in., and the weight about 7½ lbs.: the female is considerably smaller. The space between the bill and eye is bare, but the plumage generally is compact and the feathers rounded, those on the neck being short; the color is a bright scarlet, deepest on the wings; the quills are black, the legs red, the feet lake color, and the iris blue. The habits of the flamingo are more nocturnal than those of the heron; over the water they fly low, but over the land very high, with neck and legs extended, alternately flapping their wings and sailing; before alighting they generally sail around the place, and come down in the shallow water, often wading to the shore; they are very shy. The nest is made on a hillock of mud about 2 ft. high, in the hollow top of which on the bare earth two or three white eggs are laid about the size of a goose egg; the bird covers the eggs standing, with one foot in the water, and the young are hatched about the end of May; they take to the water at once, it is said, and cannot fly till they are three months old; they do not attain their full scarlet plumage until the second year, being rose-colored during the first. On account of its shyness the flamingo is rarely hunted, and then only for its handsome feathers. It is easily tamed, and in captivity feeds on rice, maize, and similar substances. It inhabits the warmer parts of America, especially the West Indies; it is not uncommon in West Florida and northern Alabama, but is rare to the north and west of these points.—The European bird (*P. antiquorum*, Temm.) is smaller and less brilliant. It is a regular visitant to the shores of the Mediterranean, and sometimes wanders to France and Germany; it is extensively spread over the warmer parts of Asia, and is very common along the shores of northern Africa. Its appearance and habits are the same as those of the American species. According to Gould, this species requires four years to reach maturity, during which the plumage changes greatly; before the first moult the color is uniform gray, with black tail and secondaries; in the male, the head, neck, upper and under surfaces, are a delicate rosy white, the centre of the wing bright scarlet, the primaries black, the bill reddish at the base and black at the tip, the tarsi and toes rosy red; the scarlet color is not assumed until the third or fourth year, and is brightest during spring and summer. The flesh of the flamingo is savory, and its fatty tongue is considered a delicious morsel; they were especially esteemed by the ancient Romans, and many allusions to this dish are found in their writings.—The position of the flamingo among birds is a subject of dispute; some authors place it among the waders or *grallatores*, from its long neck and legs, and consequent habits; but the best authorities rank it among the *anseræ*, or web-footed swimmers, on ac-

count of its lamellar duck-like bill, webbed feet, and muscular gizzard; if it be true that the young run to the water as soon as they are born, this of itself would seem to establish their rank among the *anseræ*.

FLAMINIAN WAY (Lat. *via Flaminia*), the principal road leading from ancient Rome to the northern provinces, constructed in 220 B. C., in the censorship of C. Flaminius, from whom it was named. It extended to Ariminum, now Rimini, on the Adriatic, about 220 m., where it joined the Æmilian way. It divided into two branches at Narnia, now Narni, in Umbria, which met at Fulginium (Foligno), again dividing at Nuceria (Nocera), and meeting at Fanum Fortunæ (Fano). It had great commercial and military importance, and still retains many of the works erected by the Roman emperors.

FLAMININUS, Titus Quintus, a Roman general, born about 230 B. C., died about 175. He was elected consul in 198, and undertook the conduct of the war against Philip, king of Macedon. By pretending that his object was to remove from Greece the Macedonian yoke, he detached many of the Greek states from Philip, and defeated him at Cynoscephalæ (197), in Thessaly, where the Roman legion demonstrated its superiority over the famous Macedonian phalanx. Philip surrendered all his Greek towns in Europe and Asia, and paid a heavy contribution to the Romans. At the Isthmian games in 196 Flamininus proclaimed the freedom of those states which had been subdued by Macedon. In 195 he diminished the power of the tyrant Nabis of Sparta, after which he occupied himself in restoring internal peace and prosperity to Greece. The next spring he returned to Rome, where his triumph lasted three days. In 188 he was sent as ambassador to Prusias, king of Bithynia, to seek the surrender of Hannibal, who had obtained an asylum there.

FLAMINIUS, Caius, a Roman general, killed June 28, 217 B. C. He was a tribune of the people in 232, consul in 228 and 217, and censor in 220. As tribune he carried an agrarian law against the opposition of the senate. In his first consulship he and his colleague attacked the Gauls beyond the Po, and were defeated. The senate then recalled the consuls, but Flamininus would not open the letter of recall, and obtained a victory over the Insubrians. A triumph was refused him on his return, but he was rewarded with demonstrations of popular favor. The circus Flaminius and via Flaminia were the monuments of his censorship. In his second consulship he marched against Hannibal, rashly gave battle, and was slain, with the greater part of his army, on the border of Lake Thrasymenus.

FLAMMARION, Camille, a French astronomer, born at Montigny-le-Roi, Haute-Marne, Feb. 25, 1842. He first studied theology and afterward astronomy, was attached as a pupil to the Paris observatory from 1858 to 1862, and

then became one of the editors of *Le Cosmos*. In 1865 he was charged with the scientific department of the *Siècle*, and he also became known as a lecturer, an aeronaut, and an advocate of spiritualism and other peculiar doctrines. He was eventually appointed professor of astronomy at the polytechnic association, president of the meteorological society, and member of several learned bodies. His principal works are: *La pluralité des mondes habités* (1864; 15th ed., 1869); *Les habitants de l'autre monde* (2 vols., 1862-'8); *Les mondes imaginaires et les mondes réels* (1865; 8th ed., 1869); *Les merveilles célestes* (1866); *Dieu dans la nature* (1866; 6th ed., 1869); and *Histoire du ciel* (1867). Several of his works have been translated into English, including his *Voyages aériens* (in Glaisher's "Travels in the Air," 1871), *Récits de l'infini* ("Stories of the Infinite," by S. R. Crocker, Boston, 1873), and *L'Atmosphère* (Paris, 1873), by C. B. Pitman, edited by J. Glaisher (London, 1873).

FLAMSTEED, John, the first English astronomer royal, born at Denby, near Derby, Aug. 19, 1646, died in Greenwich, Dec. 31, 1719. He was educated at the free school of Derby, and at a very early age manifested a strong inclination for astronomical studies. His health was so delicate that he was not sent to a university, but continued for several years to prosecute his astronomical researches at home with great success. In 1667 he demonstrated the true principles of the equation of time, in a tract which Dr. Wallis appended to his edition of the works of Horrocks. Flamsteed appears to have been the first astronomer who brought into common use the method of simultaneously observing the right ascension of the sun and stars, a mode by which the true place of any star is determinable by means of meridional altitudes and transits. In 1669 he communicated to the royal society his calculation of a solar eclipse that had been omitted in the ephemerides for the following year, together with several other astronomical observations. In 1670 he visited London, and was introduced to the savants of the metropolis. He then entered Jesus college, Cambridge, and made the acquaintance of Wroe, Barrow, and Newton. In 1673 he composed his treatise on "The True and Apparent Places of the Planets when at their Greatest and Least Distance from our Earth," a work of which Newton availed himself in his first edition of the *Principia*. In 1674 appeared his *Ephemeris*, which, with two barometers previously constructed by him, was presented by his friend Sir Jonas Moore to Charles II. and his brother the duke of York. In 1675 he was admitted to holy orders. Soon afterward, the king's attention having been called to the enormous errors of the astronomical tables then in use, he resolved to found an observatory, of which Flamsteed, through the mediation of Moore, was appointed the first director. The observatory was completed in 1676, but the astronomer had already entered

on the discharge of his duties in Greenwich. The new observatory received the name of Flamsteed house. It was so inadequately supplied with astronomical apparatus that its principal, out of his salary of £100 a year, often not regularly paid, and his other limited resources, had to provide most of those instruments which were indispensable. Here Flamsteed composed his great work, *Historia Cælestis*, the period of whose publication forms an epoch in the annals of modern astronomy. In 1684 he was presented to the small living of Buralow in Surrey, the only ecclesiastical preferment he ever obtained. Mr. Francis Baily's discovery of his papers and correspondence in 1832, published in 1835 by authority of the admiralty, has thrown much light on the history of his differences with Newton and Halley. These documents give us Flamsteed's version of those unseemly controversies, and it is not at all favorable to the reputation of those great masters of science; but there is another account in Sir David Brewster's "Memoirs of the Life, &c., of Sir Isaac Newton," which makes their conduct toward him appear less culpable, though neither just nor generous, than Flamsteed would lead us to suppose. His *Historia Cælestis Britannica* (8 vols. fol., London, 1725) was not published complete till after his death, though a partial edition had been issued in 1712, against his protest, by Halley, under authority of a committee composed of Sir Isaac Newton, Sir Christopher Wren, and others. The first volume contains his observations on the fixed stars, planets, comets, &c.; the second, the transits of stars and planets over the meridian, with their places; the third, an account of the methods and instruments used by Tycho Brahe and himself, and various catalogues of fixed stars, including his own catalogue of 2,934 stars. He also prepared an *Atlas Cælestis*, as an accompaniment to the above work, which was published in 1729, and again in 1753.

FLANDERS (Flem. *Vlaenderen*, Fr. *Flandre*), formerly a part of the Netherlands or Low Countries of western Europe, now included in Belgium, Holland (the southern part of the province of Zealand), and France (parts of the departments of Le Nord and Pas-de-Calais). Stretching along the North sea from the western inlet of the Scheldt to the entrance of the straits of Dover, it was bounded N. and E. by that river and its branch the Dender, while on the south it joined the province of Artois. The name occurs for the first time in the 7th century, when Eloi, bishop of Noyon and treasurer of King Dagobert I., visited northern Neustria. By the treaty of Verdun (843) Flanders was included in the kingdom of France, and about 20 years later it was erected into a county under the rule of Baldwin of the Iron Arm, son-in-law of King Charles the Bald. Baldwin's successors took rank among the six lay peers of France, and figured conspicuously in French history. His family having become extinct in

1119, the county was held till 1127 by Charles I., the Good, son of Canute, king of Denmark; then for a year by William Cliton, the nephew of Henry I. of England; and finally by Thierry, son of the duke of Lorraine, whose dynasty, known as the Alsatian, reigned till 1280. A last family of counts was established by Guy de Dampierre, and lasted till 1384, when Flanders was united to the states of Philip the Bold of Burgundy, who had married the heiress of the last count. At the death of Charles the Bold in 1477, his daughter Mary, by marrying the archduke Maximilian, brought Flanders to the house of Austria. It was incorporated by the emperor Charles V. among the 17 provinces which formed the circle of Burgundy. On his abdication it became one of the dependencies of Spain, which lost a portion of it by its northernmost section being annexed to Zealand when the seven United Provinces declared their independence. Afterward a portion of its southern territory was conquered by Louis XIV., and received the name of French Flanders. In 1713 the peace of Utrecht transferred Flanders from Spain to Austria. In 1792 it was invaded by the French, who held it till 1814, during which period it formed the departments of Lys and Scheldt. On the fall of the French empire, it was given to the king of the Netherlands, who divided it into two provinces, East and West Flanders, which since 1831 have constituted an important part of the kingdom of Belgium. In spite of so many revolutions, Flanders has always been distinguished for its industrial, commercial, and agricultural prosperity. As early as the 12th century its cities had acquired considerable importance through their manufactures, and had secured a certain degree of freedom. The democratic spirit kept even pace with the progress of trade and industry; and in the following centuries the Flemish cities were so many republican communities, paying little more than a nominal obedience to their counts. They more than once took the management of affairs into their own hands, and successfully resisted their lord paramount, the king of France. Such was the case in 1337, when Jacob van Artevelde, the brewer of Ghent, expelled Count Louis I. from the country, caused his countrymen to acknowledge Edward III. of England as king of France, and held for a while the balance between the two great contending nations. Even when the cities of Flanders submitted to their sovereigns, they protected their liberties and privileges against any encroachment, revolting repeatedly during the 14th and 15th centuries. The interest of their lords, however, was to deal mildly with the subjects from whom they could obtain immense sums of money by voluntary taxation. It was through them that the house of Burgundy became the wealthiest in Europe, for they had then reached the height of their prosperity; many burgesses of Ghent, Ypres, and Bruges had princely fortunes, and plenty was apparent everywhere. Charles V.,

by forbearance and skilful management, conciliated the Flemings, and even the despotism of Philip II. could not entirely alienate them from Spain. Flanders is still a well cultivated country, famous for its industry and commerce, and forming the richest part of Belgium; but the indomitable spirit of old times has been tamed into a moderate love of political liberty. (See FLEMISH LANGUAGE AND LITERATURE.)

FLANDERS, East, a province of Belgium, bounded N. by Holland, E. by the Scheldt (separating it from the province of Antwerp) and by South Brabant, S. by Hainaut, and W. by West Flanders; area, 1,158 sq. m.; pop. in 1871, 887,726. It forms an extensive plain, drained by the Scheldt and its tributaries, which, being united by canals, afford ample water communication. Its soil is not of superior quality, but is industriously cultivated, and it gives excellent crops of flax, hemp, wheat, rye, colewort, hops, beets, potatoes, and other vegetables. Great numbers of cattle are raised. Manufactures are prosperous, and comprise linen, woollen, and cotton, and beet-root sugar. Capital, Ghent; other chief towns, Oudenarde, Dendermonde, Eecloo, Alost, and St. Nicholas.

FLANDERS, West, a province of Belgium, bounded N. W. by the North sea, S. W. and S. by France, and E. by the provinces of Hainaut and East Flanders, and Holland; area, 1,249 sq. m.; pop. in 1871, 668,976. Besides the Lys and the Scheldt, by which it is watered on the southeast, it has only small streams emptying into the sea. Its surface is generally flat; and although most of its soil is sandy and poor, it has been so much improved that it yields abundant crops of wheat, oleaginous plants, flax, and tobacco. Cattle and horses are abundant. The manufacture of linen and damask is the principal industry. Capital, Bruges; other chief towns, Ostend, Furnes, Ypres, Courtrai, and Dixmude.

FLANDIN, Eugène Napoleón, a French painter and archaeologist, born in Naples, Aug. 15, 1809. His father was chief of the military commissariat under Murat, and settled in Paris after the downfall of Napoleon. Young Flandin studied drawing and painting without a master, visited Italy in 1834, and exhibited in 1836 "Venice" and the "Bridge of Sighs." In 1838, after a brief sojourn in Algeria, he painted the "Storming of Constantine," which became the property of Louis Philippe. In 1839 Flandin was chosen by the academy of fine arts to accompany to Persia the French ambassador De Sercey; and on his return in 1843 his report and drawings were adopted by the academies and published by the government. He was at once chosen by the academy of inscriptions and belles-lettres to go to Nineveh with P. E. Botta to continue explorations there, and to sketch the monuments. He returned in 1845, and the chambers unanimously voted to publish the result of their labors, which appeared in the *Monuments de Ninive* and atlas (1849-'50). In 1846, while preparing this.

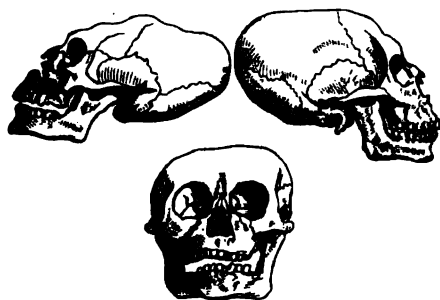
work, he published articles relating to Assyria in the *Revue des Deux Mondes*. In 1854 he began the publication of another splendid work descriptive of the countries between Nineveh and the gulf of Persia. He has since exhibited many paintings on Italian and eastern subjects. He now lives in retirement at Tours. His works are: *Voyage en Perse* (2 vols. 8vo, Paris, 1851); atlas to the same (6 vols. fol., 260 plates in line engraving, and 100 lithographed plates, with descriptive texts, 1848-'54); *L'Orient*, to be published in 40 parts of 5 plates each (parts 1 to 31, fol., 1853-'67); and *Histoire des chevaliers de Rhodes* (large 8vo, Tours, 1864).

FLANDRIN. I. Jean Hippolyte, a French historical painter, born in Lyons, March 23, 1809, died in Rome, March 21, 1864. He was the son of an obscure miniature painter, and became a pupil of Ingres in 1829. In 1832 his painting of "Theseus recognized by his Father" won the grand prize, entitling him to spend five years in Rome, where he continued to study under Ingres, who had been appointed director of the French academy in that city. Devoting himself principally to historical subjects, he produced, among other compositions, "Dante in the Circle of the Envious" (1836), which won him a second-class medal, and "St. Clair curing the Blind" (1837). He returned to Paris in 1838; and in 1839 his "Christ blessing Little Children" obtained a first-class medal. Several remarkable portraits exhibited in 1840-'41, and his first monumental frescoes executed in the church of St. Séverin, Paris, now established his reputation; and he was employed by the chief cities of France and the government in decorating their most beautiful edifices. He was preparing cartoons for what he hoped to be the crowning labor of his life, the frescoing of the minster of Strasburg, when his health broke down in the autumn of 1863. He proceeded to Rome, where he was attacked by the smallpox, and died after an illness of three days. His principal frescoes and works in stained glass are in the chamber of peers and other national buildings, the church of St. Germain-des-Prés, Paris, and in the churches of Dreux, Lyons, Nîmes, &c. His talent as a portrait painter was no less remarkable. Cornu has been intrusted with the completing of his frescoes in St. Germain-des-Prés, where a public monument to his memory has been raised by subscription.—See Vicomte Delaborde, *Lettres et pensées d'Hippolyte Flandrin*. II. Auguste, a French painter, brother of the preceding, born in Lyons in 1804, died there in 1842. He studied under Ingres in Paris and Rome, became a professor in the Lyons school of art, and obtained in 1840 a gold medal for his "Savonarola preaching in San Miniato, Florence." III. Jean Paul, a French landscape painter, brother of the preceding, born in Lyons in 1811. He studied with his brothers under Ingres, obtained second prizes for his landscapes in 1839 and 1848, and a first prize

in 1850. He also painted the baptistery of the church of St. Séverin.

FLATBUSH, a town of Kings co., New York, bordering on Brooklyn; pop. in 1850, 2,977; in 1860, 3,471; in 1870, 6,309. It is the seat of the almshouse, hospital, lunatic asylum, and nursery of the county, and contains Dutch Reformed, Episcopal, Methodist, and Roman Catholic churches. Erasmus Hall academy in 1871 had 9 instructors, 121 students, and a library of 2,738 volumes. The town has been much improved within a few years, and numbers among its residents many business men of Brooklyn and New York. The battle of Long Island (August, 1776) was fought here.

FLATHEADS. I. A term applied at different times to tribes of Indians in widely distant parts of America, and incorrectly to the Selish, the tribe now known officially as Flatheads. The name is derived from the practice of flattening the skulls of their infants by various mechanical contrivances; the model of the deformity is the same in all the tribes, and much



Skulls of Flathead Indians.

like that observed in the ancient Peruvian crania. The forehead is depressed and indented; the upper and middle parts of the face are pushed back so that the orbits are directed a little upward; the head is so elongated that in extreme cases the top becomes nearly a horizontal plane; the parietals are bent so as to form an acute angle, and instead of the occiput constitute the posterior portion of the head; the breadth of the skull and face is much increased, and the two sides are in most cases unsymmetrical. The best known tribes which flatten the heads of their children are the Chinooks, Calapuyas, Clickitats, Clatsops, Cowalitsk, and Clatsani. Among the Chinooks the child is placed in a wooden cradle, and a pad of grass is tightly bandaged over the forehead and eyes, so that it is impossible for him to see or move; and when bandaged and suspended in the usual way, the head is lower than the feet. A more cruel way is practised in other tribes by binding a flat board obliquely on the forehead. These processes continued for several months produce the deformity, which, according to Dr. Pickering, disappears with age, so that most adults present no trace of it. This

shape of the head is so highly prized among the Chinooks that their slaves are not allowed to practise artificial flattening. The internal capacity of the skull is not diminished by the flatness, and the intellect is not affected, as all travellers agree that these nations are remarkably shrewd and intelligent; but it is said that they are particularly subject to apoplexy. The Chinooks are the best known of the Flatheads; they inhabit the S. shore of the straits of Fuca, and the deeply indented territory as far as the tide waters of the Columbia river. They are commonly diminutive, with ill-shaped limbs and unprepossessing features; the oblique eye and arched nose are occasionally seen among them; their complexion is darker than that of the more northern tribes who do not flatten the head. They have the filthy habits and the usual vices of the N. W. Indians, but are said to be superior to the hunting tribes of America in the useful and ornamental arts; their climate is comparatively mild and moist from the prevalence of westerly winds, and they are a fishing and maritime people. They differ from the northern tribes in language as well as in physical characters. Dr. Morton, in plates 42 to 50 of the *Crania Americana*, gives descriptive illustrations of several skulls of the Columbia river tribes.—The custom of flattening the head is very ancient, but the modern Indians, except those of the N. W. coast, do not generally practise it; it was a custom in Peru before the arrival of the Incas, and was practised also by the Inca Peruvians to a comparatively recent date. It seems to have been principally employed by the Toltecan branch of the American nations, including the semi-civilized race of Mexico, Peru, and Central America, and the ancient mound builders of the Ohio and Mississippi valleys; the Natchez tribe of Florida and the southern states, the Choctaws, and the Caribs (both insular and continental) flattened the skulls of their children by various devices, either in a vertical direction (as in the Natchez) or longitudinal one (as in the ancient Peruvians).

II. Properly SELISH, a small tribe of Indians, the most important and civilized branch of the Selish family. The origin of the name Flatheads as applied to them is unknown, as they do not flatten the head. They were visited by Lewis and Clarke in 1806-'7, and are mentioned by the name of Hopilpo. They resided on the Bitter Root or St. Mary's river, the largest tributary of Clarke's river, and numbered about 600. In 1830 they, with other Oregon tribes, were greatly reduced by pestilential fevers. Although a peaceful, industrious tribe, they became warriors to defend themselves against the Bannacks, Crows, and Blackfeet, but have never made war upon the whites. Hearing of Christianity from an Iroquois of one of the Canada missions, they sent three deputations to the Jesuits in St. Louis to obtain a missionary. Father P. J. De Smet went to the tribe in 1840, and began a mission which soon made the whole tribe Christians. They were

poor, miserable, half starved, and nearly naked, living on fish and roots, and having no means of crossing rivers except their lodge skins; but they were willing to work, made rapid progress in agriculture, and have adopted the habits and dress of whites. They are remarkably sober and honest, and good warriors, although preferring peace. They were long governed by an excellent chief, Victor, regarded also as chief of the Pend d'Oreilles and Kootenays. The missionaries introduced agricultural implements, horses, and cattle, and the tribe prospered, being long without agents or traders. The treaty of Hellgate, July 16, 1855, approved by the senate on March 8, 1859, ceded all their lands without any consideration paid by government; and though it seemed to secure them their lands on the Bitter Root, yet under an order issued by President Grant on Nov. 14, 1871, they were removed to the Jocko reservation, which comprises 1,488,600 acres in the N. W. part of Montana. Of this tract the portion assigned to them is the worst. Any head of a family who would renounce tribal relations was permitted to take up 160 acres in the Bitter Root valley, and congress appropriated (June 5, 1872) \$50,000 to pay for their houses and improvements there. It was also stipulated that 60 houses should be built for them, but only 11 were begun. Charlot, the chief who succeeded Victor, refused to sign the contract for the removal to the Jocko reservation. They have recently been attacked by the Sioux and lost many warriors. In 1872 they were reported at 460, which is evidently too low, with a school directed by missionaries and sisters of charity, and containing 29 pupils; they raised wheat, corn, oats, potatoes, and hay to the value of more than \$7,000; had 1,200 horses, 800 cattle, and 250 swine. Their language is remarkably difficult. Its grammar has been published by Mengarini (New York, 1861). It is spoken with some dialectic differences by the Kalispels or Pend d'Oreilles, the Spokans, Cœurs d'Alènes, Kettlefall Indians, Okanagans, Clallams, Lummi, and Shewhappmuck.

FLAUBERT, Gustave, a French novelist, born in Rouen about 1821. He abandoned the study of medicine for literature, and published a licentious novel, *Madame de Bovary* (2 vols., Paris, 1857), which met with considerable success, partly owing to legal proceedings which were instituted against him for its alleged immorality, but which fell to the ground. Among his other works are *Salammbô* (1862), a novel embodying the results of his explorations about Carthage, and *L'Éducation sentimentale, histoire d'un jeune homme* (2 vols., 1869).

FLAVEL, John, an English clergyman and author, born at Bromsgrove, Worcestershire, about 1627, died in Exeter, June 26, 1691. He was educated at Oxford, became a curate at Diptford, and was called in 1656 to Dartmouth. He was one of the 2,000 clergymen who refused to subscribe to the "Act of Conformity" passed in 1662, and was therefore

expelled from his benefice. He continued to preach as opportunity offered, in private dwellings, obscure neighborhoods, or forests, till 1687, when, the royal license being granted to worship without molestation, he resumed his public labors in a new church erected by his people. Most of his works, which are held in high esteem and have been many times reprinted, were composed during the period of his persecution. "Husbandry Spiritualized" is one of the most popular; among his other chief works are "A Treatise of the Soul of Man," "Divine Conduct," "The Fountain of Life," "The Method of Grace," "A Token for Mourners," &c. An edition in 6 vols. 8vo appeared in London in 1820; "Select Works," 1833.

FLAX, the common name of the plant *linum usitatissimum*, and also of its most important product, the filaments obtained from the fibrous covering of its hollow stems, used from the remotest times in the manufacture of linen

pure gum soluble in cold water; and the interior portion yields the peculiar oil already referred to. The plant, now cultivated in almost all parts of the world, is supposed by many to have been first known in Egypt, or possibly in the elevated plains of central Asia; but though no doubt a native of warm climates, the fibre attains its greatest fineness and perfection in temperate regions. The seed is richer in the tropics. Near the northern limits of its cultivation the product of the flax is abundant, but the quality is inferior. The flax of Holland and Belgium commands a higher price than that of Russia. This difference is owing partly to the extreme care given by the Hollanders and Belgians to its preparation. The Irish, who have cultivated the crop from an early period, and who seem to possess as great natural advantages for its culture as any people, rarely furnish so valuable an article as the Belgians. The greater part of the importation is from Russia, and the countries bordering on the Baltic. The rich soil of the valley of the Nile is well adapted for its cultivation, and the product of Egypt is increasing under the encouragement given by the English, who find it more economical to procure their supplies from foreign countries than from their own.

—The New Zealand flax is obtained from the leaf of an endogenous perennial plant, *phormium tenax*, which is a native of New Zealand and Norfolk island. The leaves are from 2 to 6 ft. long and from 1 to 3 in. broad, and have a fine strong fibre, which was once used by the New Zealanders for making dresses, ropes, twine, mats, cloth, &c. This species of flax has been imported into Great Britain, where it has been chiefly used for making twine and ropes; but its importation is now unimportant and its price low.—Flax appears to have been cultivated in New Netherland as early as 1626. The seed of flax was ordered to be introduced into the colony of Massachusetts in 1629, and flax was cultivated in that state soon after the war of independence, particularly at a distance from the coast. Manufactories for making sail cloth were established at Salem and Springfield in 1790. In Virginia flax was annually cultivated, spun, and woven by Capt. Matthews prior to 1648. Bounties for its production in that colony were offered in 1657. Flax was among the products for the encouragement of whose cultivation the British parliament made considerable grants to the patentees of Georgia in 1733, 1743, and 1749. Early attention was given to the cultivation and manufacture in Pennsylvania, Ohio, Kentucky, and Indiana. According to the census of 1870, the total amount of flax produced in the United States was 27,133,034 lbs., of which 17,880,624 lbs. were produced in Ohio, 8,670,818 in New York, and 2,204,606 in Illinois. The total amount of flax seed was 1,730,444 bushels, of which 681,894 were the product of Ohio. In 1872 85,868 acres were sown with flax in Ohio, which produced 738,384 bushels of seed and

Flax (*Linum usitatissimum*).

thread. The coverings of the Egyptian mummies testify that the linen mentioned by the most ancient writers was the product of the flax plant. The seeds furnish linseed oil; and of the residue, after this is expressed, is made the oil cake which is extensively used for feeding and fattening cattle. On account of its mucilaginous character, flax seed is also employed in medicine, its infusion in boiling water having a soothing effect in cases of inflammation of the lungs, intestines, &c.; and when ground to meal and mixed with hot water, it forms an excellent emollient poultice. The flax plant is a slender annual, from 2 to 3 ft. high, bearing small lanceolate leaves distributed alternately over the stalks. These terminate in delicate blue flowers, which are succeeded by globular seed vessels of the size of small peas, containing each 10 seeds, brown, oval, and flat, and remarkably bright, smooth, and slippery. The husk of the seed yields 52.7 per cent. of a

24,477,361 lbs. of fibre. In 1870 there were in the United States 90 establishments for dressing flax, the products of which were valued at \$815,010. Of these establishments, 46 were in New York and 27 in Ohio. During the year ending June 30, 1873, 4,171 tons of raw flax, valued at \$1,187,737, were imported into the United States, the largest quantities being from England and Russia; and the imports of flax manufactures, chiefly from England and Scotland, amounted to \$20,428,891.—The manufacture of flax constitutes an important element of British industry. In 1871 there were in England and Wales 155 flax factories, with 869,768 spinning spindles and 19,816 operatives, of whom 12,614 were females; in Scotland the number of factories was 191, having 317,085 spinning spindles and employing 49,917 hands, of whom 36,362 were females; while in Ireland there were 154 factories with 866,482 spinning spindles and 55,089 operatives, of whom 87,700 were females. The imports of rough or undressed flax for 1872 amounted to 1,518,855 cwt., valued at £3,772,279. Most of this amount came from Russia, the imports from that country amounting to 1,115,804 cwt., valued at £2,690,610. Germany, Belgium, and Holland ranked next in order. In addition to the above, 176,789 cwt. of dressed flax, valued at £659,704, were imported, mostly from Belgium. In 1872 there were 187,360 acres planted with flax in the United Kingdom, of which 122,008 were in Ireland.—The flax crop thrives upon almost any good soil thoroughly pulverized and well drained, but more especially upon rich sandy loams regularly supplied with moisture during the spring months. In Ohio, three pecks of seed are sown to the acre, which yields from six to twelve bushels of seed and from one to two tons of straw, which is manufactured into tow for rope walks and paper mills. It may be sown very early in the spring, and to good advantage succeeding a crop of grain. As it is gathered in July or early in August, another crop may be obtained from the same land during the season. A common practice with the Belgians is to sow the white carrot broadcast with the flax, and when the latter is gathered, which is done by pulling the plants by the roots, the soil is loosened around the young carrots, and being then top-dressed with liquid manure, they thrive luxuriantly. Grass or clover seed is also often sown immediately upon the flax seed. The better soils take three bushels of seed to the acre, the poorer two bushels. The finest fibre is obtained by a thick growth of slender stalks. The Dutch take great pains to weed the crop by hand, when the plants are two or three inches high. In June the plants are in bloom, and the fields present a beautiful appearance, covered with the delicate blue flowers. The time for gathering is indicated by the leaves beginning to drop off, and by the bottom of the stalks becoming yellow; also by the con-

dition of the seed bolls, which should be examined almost daily about the time of maturity of the crop. When the ripest on being cut open with a sharp knife do not appear within whitish and watery, but firm and dark green, the flax is fit for pulling. Soon after this the seeds would begin to fall, and the fibre would lose its silkiness and elasticity. But if it be desired to obtain seed for sowing, the plants must be allowed to fully ripen at the cost of the deterioration of the fibre. As the flax is pulled, it is gathered in bundles to dry; and then if the seeds are thoroughly ripened, they may be separated by the threshing mill. The ordinary course, however, is to strip the seeds by the process called rippling, which is drawing the stalks, a handful at a time, through a set of iron teeth standing in a row, half an inch apart at top and a quarter of an inch at bottom. Four men with two rippling combs will separate the seeds, it is estimated, from more than an acre of flax in a day. The seed bolls should be well dried, and then stored away in bags in an airy place. At convenient times they are threshed and winnowed to separate the seed from the capsules, preparatory to obtaining by expression the oil and the oil cake. The culture of flax and its preparation for market involve more labor than almost any other crop. The seeds are preferred which are brought from Riga, and next to these the Dutch; the American produce a coarser stem. The soil should be thoroughly prepared by repeated harrowing after deep ploughing. The weeding requires peculiar care, that it may be sufficient without injury to the young plants. The soil should be kept rich by judicious manuring; for flax is commonly regarded as an exhausting crop. The plan of returning to the soil the water in which the stalks are steeped, by which it is estimated nine tenths of the nutritious matter taken away are restored, is highly recommended. The pure fibre yields no ashes, so that it takes nothing from the soil, and the manure of the cattle fed upon the oil cake will restore much of the solid constituents of the seeds. Dr. Ure gives the following mixture of salts, "which it has been said will replace chemically the constituents of the plants produced from an acre of land, viz.: muriate of potash, 30 lbs.; common salt, 28; burned gypsum, powdered, 34; bone dust, 54; sulphate of magnesia, 56." The preparation of the flax for market finds occupation for the cultivators in the winter season; but this can be economically conducted only where many are engaged in the culture, and mills are provided with the requisite machinery. In the flax districts of Belgium it is stated there are no paupers, as the whole population find employment during the winter.—The first process in the preparation of the fibre is to steep the stalks in water until fermentation takes place. This causes the glutinous matter, which binds the hark or the fibrous portion to the woody core, called the boon, to be decomposed, and the

fibres are thus set free. The water most suitable for this purpose is soft river water. The flax is left more free from color by a stream of water flowing over the bundles than if these are steeped, as is often done, in a pool, the water of which is kept to be applied to the soil. This process is called water-retting or rotting. The result is sometimes obtained by exposing the flax on grass plots to the dew and rain, when the operation is called dew-retting. This requires much longer time, and also the control of extensive grass fields. It is an excellent method to combine the two processes, commencing with the water-retting, and when the boon is partially rotted and the gummy matter loosened, to complete the operation upon the grass; the risk of carrying the fermentation too far and injuring the fibre is thus avoided. When the steeping process alone is employed, the flax is removed from the water as soon as the harl is found to separate by the fingers from the boon, and this breaks without bending. At this stage also several stalks knotted together sink in the water. The duration of the process is from 6 to 20 days. The ripier the plant, the longer is the time required; hence the necessity of sorting the stalks into bundles of similar qualities. The bundles, being lifted out of the water by hand, are set on end to drain for 24 hours, and the stalks are then spread upon grass, and occasionally turned, to be softened and ripened by exposure for several days. When again gathered and made into sheaves, these may be kept for years in stacks, the quality of the fibre continuing to improve for some seasons. Though the fermenting process is not intended to pass to the putrefying stage, a disagreeable odor is given out from the flax, which even contaminates the air of the district, and the waters are so affected that the fish are poisoned. A more expeditious and agreeable process was therefore highly desirable, and such a one was devised by Mr. R. B. Schenck of New York, and successfully introduced into the flax districts of Ireland in 1847. This consisted in steeping the stalks in water heated by steam pipes to a temperature of about 90° F. The gummy matter is thus rapidly decomposed, so that in about 60 hours the operation is completed without the escape of any disagreeable odors. The mucilaginous water is then drawn off, and the flax is set to dry upon frames, the waste steam of the engine being used, if necessary, to heat the air for hastening the drying. Other improvements have also been introduced, as that of Mr. Bower of Leeds, which consists in rolling the stalks after they have been steeped in cold or warm water, again steeping, and again rolling. The glutinous matter is thus more thoroughly removed. The addition of a pound of caustic ammonia or of common salt or Glauber salt to every 150 lbs. of rain water is recommended; and the temperature being kept at from 90° to 120°, the operation may be completed in 80 hours. The most rapid process, however, is to steep the flax for

a short time, and then exhaust the air from its fibres by the action of an air pump. Twice steeping and twice exhausting the air serve to remove the glutinous matter in a few hours. Attempts have been made to substitute for the retting mechanical methods of separating the fibre from the boon, but they have not been successful, owing to the inferior quality of the filaments thus prepared. The introduction of chemical matters to hasten the fermentation has been greatly objected to from their liability to weaken the fibres. The reducing of the fibre to the condition of cotton by the process of the chevalier Claussen has excited strong opposition on this account. He had observed that the flax caught in the branches overhanging a stream in Brazil, which ran through his flax fields, was by repeated wetting and exposure converted into a substance exactly like cotton. He then contrived a way of attaining the same result by exposing the flax to the action of a weak alkaline solution, and afterward removing the alkali by boiling in water to which $\frac{1}{10}$ to $\frac{1}{20}$ of sulphuric acid is added. The straw is next steeped in a strong solution of bicarbonate of soda; and when the fibres are filled with this salt, it is transferred to a solution of sulphuric acid, weak like the former. Carbonic acid gas is generated throughout the substance, and this bursts and splits the fibre in a remarkable manner, giving it the appearance of cotton. Samples of various fabrics of this material, both alone and mixed with cotton, and others with wool, and also with silk, were placed by Claussen in the London exhibition of 1851, and attracted much attention. The same article, however, appears to have been made in England and Germany during the last century, and a factory was established near Vienna in 1780 for its manufacture. Berthollet, Gay-Lussac, and Giobert have experimentally investigated the subject, and Berthollet states that as fine cotton may be obtained from the commonest refuse tow as from the best flax. For some reason, however, possibly the expense of the process or the inferior quality of the fibre, the operation does not seem to have prospered.—After the flax has been retted and dried, it is submitted to the process called breaking, by which the straws are cracked repeatedly across, the effect of which is to produce the separation of the brittle woody portion, which falls away in pieces from the filaments when afterward beaten by a broad flat blade of wood in the operation of scutching. A variety of machines are used for cracking the boon. The most simple is made with a large wooden blade, called a swingling knife, worked by a handle at one end, and fastened by a pivot at the other into a block with a cleft into which it fits; across this block the flax is laid, a handful together, broken by the blade, and moved along, as straw or hay is chopped in a common cutter. Other brakes are worked by the foot—a grooved block being brought down by each impulse upon the flax, which is

held across a fixed block with corresponding grooves; a rude spring jerk the movable block up again as the foot releases it. In the winnowing or scutching the Germans make much use of a thin sabre-shaped wooden knife, with which they strike the flax as a handful of it is held in a horizontal groove in an upright board. The coarse tow and woody particles are thus removed, those which adhere most firmly being scraped or rubbed off by laying the flax upon the leather worn for this purpose upon the leg of the operator. It is estimated that 100 lbs. of dried retted flax should yield 45 to 48 lbs. of broken flax; and from this when the boon waste is further removed by scutching about 24 lbs. of flax are obtained and 9 or 10 lbs. of tow. The breaking of 100 lbs. of straw by the machine described requires the labor of 17 to 18 hours; and the cleaning of 100 lbs. of broken flax by the swinging knife takes about 130 hours. Flax is broken also upon a larger scale by machines consisting of fluted rollers, variously contrived; and other labor-saving machines with rotating blades have been applied to the process of scutching. The next process is hatchelling or carding. As performed by hand, a wisp of flax, held in the middle and well spread out, is thrown so as to draw one end of it over a set of sharp steel teeth which are set upright and serve the purpose of a comb. One end of the bundle being hatchelled, it is turned round, and the other is treated in the same way; and the process is repeated on finer hatchels. By this means about 50 per cent. of tow and dust and woody particles are separated from the long fibre, now called line. This is fit for spinning into linen threads, and the tow may be used for the same purpose for coarser fabrics. Machine hatchelling, however, has for the most part taken the place of hand labor, and is conducted upon a large scale and with many modifications in the extensive linen mills. The flax, being cut in lengths of 10 or 12 inches, is arranged in flat layers called stricks, the fibres parallel and ending together. Each of these is held by two strips of wood clamped together across its middle, or sometimes across one end. They are placed around a revolving drum, within which another drum armed with teeth rapidly revolves in a contrary direction, and combs the flax as the ends fall among the teeth. When hatchelled on one side the stick is turned over and the process is repeated on the other. The outer drum revolves slowly, and discharges the stricks when they have been carried over the top of the inner drum, beyond the point where the fibres could no longer fall among the teeth. Much ingenuity is displayed in the modifications of this machinery, and also of a preparatory machine for dividing the fibres into equal lengths and sorting the lower ends, the middles, and the upper ends, each by themselves. The stricks when hatchelled are sorted according to the fineness of the fibres, those made up of the lower ends being the coarsest; but the divi-

sions are much more minute than those of each fibre into three lengths. In making this separation the line sorter, as the operator is called, is guided entirely by the sense of feeling, this indicating the quality of the fibres more delicately than the sight. The next operation preparatory to spinning is to lay the fibres upon a feeding cloth, each successive wisp overlapping half way the one preceding it. The feeding cloth conveys them to rollers, between which they are flattened and held back as a second pair more rapidly revolving seizes the part in advance and draws out the flax. A tape or ribbon of flax is thus formed, which is discharged into a tin cylinder, a row of cylinders standing upon the floor in front of the machines. The tapes or slivers are afterward joined several together, and at the roving frame are slightly twisted, when they are wound upon bobbins, which is the last process before spinning. (See LINEN.)—The principal treatise upon this subject is the prize essay of James MacAdam, jr., secretary to the society for the promotion and improvement of the growth of flax in Ireland. The prize was awarded to it by the royal agricultural society of England, and the essay was published in vol. viii. of their "Journal." It has furnished a great part of the data of many of the valuable papers published in the English scientific dictionaries.

FLAXMAN, John, an English sculptor, born in York, July 6, 1755, died in London, Dec. 9, 1826. In the workshop of his father, a moulder of figures in London, he acquired his first ideas of form. Showing a strong inclination for modelling, he was placed at the royal academy. After many years of severe study, during which he supported himself by designing for the Wedgwoods and others, and produced some meritorious works, including a monument to the poet Collins in Chichester cathedral, he went in 1787 to Rome. He had read the Greek poets in the original, and produced two series of outline illustrations of Homer and Æschylus, by which he is perhaps more widely known than by any of his other works. His series of illustrations of Dante is almost equally celebrated. After seven years' sojourn in Rome he returned to England, and commenced a series of Scriptural compositions, remarkable for religious fervor and pathos. Of the numerous statues which he executed, those of Nelson, Howe, Sir Joshua Reynolds, Mansfield, and Kemble are the best known. His "Shield of Achilles" is one of the finest achievements of modern art. Flaxman was a member of the royal academy, in which he also filled the chair of professor of sculpture, to which he was appointed in 1810. He received for his designs for the Iliad and Odyssey, 73 in all, 15s. each, and for many of his models for Wedgwood only half a guinea. His lectures were published in 1829, and a new edition with a memoir in 1838.

FLEA. See EPIZOA.

FLEABANE, the common name of herbs of the genus *erigeron*, order *composita*, having a

naked receptacle, and a rough pappus, consisting of a single row of capillary bristles with minuter ones intermixed, or with a distinct outer pappus of small bristles or scales. The solitary or corymbed heads are many-flowered, radiate, flat or hemispherical; disk yellow, rays white or purple; leaves entire or toothed, and generally sessile. Formerly the plants were supposed to have the power when suspended in a room of driving away fleas; hence the name. The daisy fleabanes, *E. annuum* and *E. Philadelphicum*, are found in various parts of the United States. They have a bitterish taste and a feebly aromatic odor, due to a small amount of volatile oil. Fleabane is diuretic, and has been used in nephritic diseases and dropsy. It is most conveniently given in infusion or decoction. *E. Canadense*, or Canada fleabane, possesses similar properties. It is also called horseweed and butterweed, and is common throughout the country. The volatile oil, of which it contains a larger proportion than the two species first mentioned, is officinal, and may be used in the dose of from five to ten drops. It has been recommended by some practitioners in the treatment of uterine hæmorrhage, but does not possess much control over that difficulty. Occasionally when the stomach is irritable it will be retained while other diuretics are rejected. It may often be added with advantage to other agents similar in effect.

FLÉCHIER, Esprit, a French pulpit orator, born at Pernes, June 10, 1682, died in Montpellier, Feb. 16, 1710. He was educated at Avignon, in the college of the "Fathers of the Christian Doctrine," gave special attention to the culture of eloquence, was noted for the elegance of his language, taught rhetoric at Narbonne, and in 1661 went to Paris, where without fortune or friends he became catechist in a parish. A Latin poem which he wrote, describing the famous tournament celebrated by Louis XIV. in 1662, was much admired, and he soon after became preceptor in the house of Caumartin, a councillor of state, and was admitted into the society of the hôtel de Rambouillet. Many of his sermons were highly esteemed, but his funeral oration on the duchess of Montausier in 1672 was his first great triumph. His funeral oration on Turenne, delivered in Paris in 1676, was a masterpiece of art, and placed him, in the opinion of many of his contemporaries, by the side of Bossuet. Among his other funeral orations, those on the first president Lamoignon, on Queen Marie Thérèse, and on the chancellor Letellier, were most admired. Louis XIV. bestowed upon him first the abbey of St. Séverin, then the position of reader to the dauphin, the bishopric of Lavaur in 1685, and that of Nîmes in 1687. The edict of Nantes having been revoked shortly before the appointment of Fléchier to his last diocese, which contained numerous Protestants, he found great difficulty in the ecclesiastical government of it. His conduct, however, made him equally dear to the Catholics and Protestants of Languedoc,

who united in mourning his death. Besides his funeral orations, he left *Panegyriques des saints* (3 vols.), *Vie de Théodose le Grand*, and *L'Histoire du cardinal Ximènes*. Fléchier's charity and amiability appear especially in his letters. A complete edition of his works was published at Nîmes in 1782 (8 vols. 8vo).

FLECKNOE, Richard, a British poet, contemporary with Dryden, died about 1678. Little is known of his life, and he is remembered only because his name furnished Dryden the title of his satirical poem against Shadwell, "MacFlecknoe." He is believed to have been an Irish Catholic priest, and wrote several comic plays, among which are "Demoiselles à la Mode," "Love's Dominion," "The Marriage of Oceanus and Britannia," and "Ermina, or the Chaste Lady." He wrote also a volume of "Epigrams and Enigmatic Characters." His poems are of little value, though some of them have been praised by Southey.

FLEETWOOD, Charles, an English republican, son of Sir William Fleetwood, died in 1692. At the commencement of the civil war he enlisted as a trooper in the parliamentary army, and in 1645 was made colonel, and governor of Bristol. In the same year he was returned to parliament for Buckinghamshire, and in 1647 he was one of the commissioners to treat with the king. After the establishment of the commonwealth he became lieutenant general, distinguished himself at the battle of Worcester, and in consequence of his great influence with the army, after the death of his first wife Cromwell gave him his eldest daughter Bridget, the widow of Ireton, in marriage. In 1652 he was appointed commander-in-chief of the forces in Ireland, and afterward lord deputy; but his opposition to the ambitious projects of his father-in-law soon caused his recall. He was appointed one of the fourteen major generals to whom the internal government was committed during the latter days of the protectorate. On the death of the protector he endeavored by his influence with the troops to supplant Richard Cromwell, but in the midst of his intrigues the Stuarts were restored, and he narrowly escaped execution as a rebel. He retired to Stoke-Newington, and passed the rest of his life in obscurity. He was cunning, timid, and irresolute, with but little military skill; and his influence and promotion in Cromwell's army were mainly due to his power in praying and extemporaneous preaching.

FLEETWOOD, William, an English prelate and author, born in London in January, 1656, died at Tottenham, Aug. 4, 1728. He graduated at Cambridge, and became chaplain of William III., bishop of St. Asaph in 1707, and bishop of Ely in 1714. He was an eminent pulpit orator, and probably the best preacher of his time. Among his numerous works are: "Essay on Miracles" (1701); *Chronicum Preciosum* (1707); and "Free Sermons" (1712), the preface of which was condemned by the house of commons to be burned because it advocated

whig principles. It was nevertheless published and praised in Addison's "Spectator."

FLEISCHER, *Helarich Leberecht*, a German orientalist, born at Schandau, Feb. 21, 1801. He studied in Leipzig and Paris, and was professor at Leipzig from 1835 to 1860. Since then he has occupied the chair of the Arabic, Persian, and Turkish languages at the university of Berlin, and ranks among the best Arabic scholars of Germany. His translation of Zamahshari's "Golden Necklaces" (Leipzig, 1835) involved him in a protracted controversy with Hammer-Purgstall. He continued the edition of the Arabic text of the "Thousand and One Nights," which was commenced by Habicht (completed in 12 vols., Breslau, 1843). Among his principal works are his editions of Abulfeda's *Historia Ante-Islamica* (with translation, 1831), of Beidhawi's "Commentary on the Koran" (1844-'8), and a free translation of Mirza Mohammed Ibrahim's modern Persian grammar (1847).

FLEMING, a N. E. county of Kentucky, bounded S. W. by Licking river; area estimated at 500 sq. m.; pop. in 1870, 13,898, of whom 1,556 were colored. The E. part is hilly and the W. undulating. The soil is generally good. Near Licking river is a remarkable deposit of iron fulgurites, the oxide being formed into regular tubes of various diameters, from that of a pistol barrel to several inches. The chief productions in 1870 were 53,011 bushels of wheat, 26,466 of rye, 686,538 of Indian corn, 78,242 of oats, 26,488 of potatoes, 219,970 lbs. of butter, 27,854 of wool, and 805,954 of tobacco. There were 4,705 horses, 2,915 milch cows, 6,019 other cattle, 9,552 sheep, and 1,904 swine; 2 flour mills, 3 saw mills, and 2 distilleries. Capital, Flemingsburg.

FLEMING, *John*, a Scottish naturalist, born at Kirkcaldy, near Bathgate, Linlithgowshire, in 1785, died in Edinburgh, Nov. 18, 1857. Although possessing an unusual taste for the natural sciences, he entered the ministry, and about 1807 was licensed as a preacher. In 1808, while engaged in a survey of the western isles, he accepted the living of Bressay in Shetland. About the same time appeared his "Economical Mineralogy of the Orkney and Zetland Islands;" and thenceforth for nearly 30 years his attention was pretty equally divided between his clerical duties and his scientific pursuits. In 1810 he exchanged the living of Bressay for that of Flisk, in Fifeshire. His contributions to public journals and to learned societies now became frequent. In 1822, having furnished the article "Ichthyology" for the "Encyclopædia Britannica," and those on "Helmintology" and "Insecta" for the "Edinburgh Encyclopædia," besides numerous papers for the "Proceedings" of the Wernerian society and the royal society of Edinburgh, and the "Edinburgh Philosophical Journal," he published his first important work, the "Philosophy of Zoölogy" (2 vols., Edinburgh). In the second volume he enun-

ciated a system of classification at variance with those of Linnaeus and Cuvier, and known as the binary or dichotomous system, the leading feature of which consists in arranging animals according to their positive and negative characters. In his "History of British Animals" (Edinburgh, 1828), the first decided attempt was made by a British naturalist to exhibit the palæontological history of animals, by the side of those belonging to our epoch. The great principle laid down by him, from which he never receded, is that the revolutions which have taken place in the animal kingdom have been produced by the changes which accompanied the successive depositions of the strata. In 1832 he was called to the chair of natural philosophy at King's college, Aberdeen; but in 1843, having identified himself with the Free church, he was obliged to retire from his professorship. Two years later he was elected to the chair of natural science in the New (Free church) college, Edinburgh, with which he remained connected until his death. In addition to the works enumerated, Dr. Fleming published "Molluscan Animals, including Shell Fish" (Edinburgh, 1837), "The Temperature of the Seasons" (1851), "The Lithology of Edinburgh" (1858), and considerably more than 100 papers, principally on zoölogy, palæontology, and geology.

FLEMISH LANGUAGE AND LITERATURE. The *Vlaemsch* or *Duytsch*, one of the many Teutonic dialects, is the vernacular of the Vlamingen (about 2,500,000) in the Belgian provinces of East and West Flanders, Antwerp, and Limburg, in North Brabant, Holland, and in some parts of the French department of Le Nord, and also scattered in the Wallonic (Gallo-Romanic) provinces of Belgium; French also being spoken in the large cities and used in official documents. It is akin to the Frisian and to the Hollandish or Dutch, which is its younger branch. It is more palatal and nasal than the Dutch, which is more guttural. The difference between the Flemish and Dutch languages consists principally in the orthography of words containing in Dutch the double vowels *aa*, *ii* or *ij*, *oo*, *uu*, which in Flemish retain the older forms *ae*, *y*, *oe*, *ue*. All words containing these double vowels are pronounced alike in the two languages, with one partial exception. In West Flanders and the department of Le Nord, France, where the old Flemish is spoken in the greatest purity, the *y* has the sound of the English short *i* in *pin*, instead of that of long *i* in *mine*, like its Dutch analogue *ij*; as in *Mynheer*, *Mijnheer*. In the provinces of East Flanders, Antwerp, and Brabant, however, the *y* has the long sound. The main difference between Flemish and High German consists in the change of *sch* (German) into *s*, and the harsh *sz* into *t*. So little alteration has taken place in the Flemish language, that many old manuscripts can be easily deciphered at the present day.—The earliest Flemish manuscript, *Reinaert de Vos* ("Reynard the Fox"), attributed

to a priest named Willem van Utenhoven (in the 12th century), was for many years considered of doubtful origin; but at the linguistic congress held at Ghent in 1841 it was conceded and proved beyond a doubt to belong to Belgium. The next monument of the early literature is an ordinance of Duke Henry I. of Brabant (1229). A printed copy of this ordinance, taken from the "Book of Privileges" in the archives of the city of Brussels, is to be found in the literary collection of J. F. Willems (*Verhandeling over de Nederduytsche Tael en Letterkunde*, 1824). The next work of any importance was *Minneloep (Course d'amour)*, by Dirc Potter, 1230. The *Rymbybel* ("Bible in Rhymes"), the *Spiegel historiaal* ("Historical Mirror") of Jacob Maerlant (about 1285), and the civic laws of Antwerp compiled by J. van Clere (1300), are the principal works of the 13th century. In the 14th century there were scarcely any writers of note. The first religious play, *St. Gommaire*, written by H. Bal of Mechlin (1444), several others written by C. Everaet (1496), and a translation of Boëthius by Jacob Velt of Bruges, are the only literary monuments of the 15th century. In the 16th we have the *Historie van België*, by Marc van Vaerenwyck of Ghent (1514), and the "Hive of the Catholic Church," by Philip van Marnix (1569). Many French forms of speech were introduced during the Burgundian reign, and also many Hollandish during the sway of the Hapsburgs, so that the old Flemish lost much of its purity and terseness. Hooft, Vondel, and Cats are the three most prominent names of the 17th century, which embraces the golden age of Flemish literature (coinciding with the stadtholdership of Frederick Henry of Orange, 1625-'47). The 18th century furnishes scarcely any work of note, if we except the "Comparison of the Gothic and Low Dutch languages," by Ten Kate (*Gemeenschap tusschen de Gothische Spraake en de Nederduytsch*, 1710), *Gramschap*, a poem by the Jesuit Liévin de Meyer of Ghent (1725), and the beautiful poem *Roozje* ("Little Rose"), by Bellamy (1772), which has been translated into nearly all the European languages. At the commencement of the 19th century we have Feith, the imitator of Goethe and the apostle of the modern school of Flemish literature (1812); Willems, on the Flemish and Dutch mode of writing the language of the Netherlands (*Over de Hollandische en Vlaemsche Schryfwyzen van het Nederduytsch*, 1824); and D'Hulster (1834). The prize poem on the subject of Belgian independence was written by Ledeganck, who was crowned poet laureate at Ghent in 1834. The most popular writer at the present day is Hendrik Conscience, born in Antwerp in 1812. His novels are translated into English, French, and German. Among the names of those who have exerted themselves toward the diffusion and improvement of the language are Blommaert, Van der Voorde, Delecourt, De Laet, Dedecker, Van Ryswyck, Rense, Van Duyse,

F. Blicke, Serrure, the abbé David, Bormans, Snellaert, and Lebrocqy. The Belgian government was at first opposed to this movement, or at least looked upon it with coldness; but latterly it has come to recognize it and give it countenance. On the occasion of the linguistic congress at Ghent in 1841, the members of the government for the first time publicly addressed the people in the Flemish language. In 1860 there were 76 political and 31 other newspapers and periodicals published in Flemish.—See Vandenbossche, *Nouvelle grammaire raisonnée pour apprendre le flamand et le hollandais* (Lille, 1825); J. Desroches, *Grammaire flamande* (Antwerp, 1826); the grammars of Van Beers and Van Heremans; Noël de Berlemont, *Vocabulaire françois et flameng* (Antwerp, 1511); Plautin, *Thesaurus Teutonicæ Linguae*, perfected by C. Kilian (Antwerp, 1573); Corlevis, *Trésor de la langue flamande* (Amsterdam, 1741); Halma, *Grand dictionnaire françois et flamand* (Leyden, 1778); Desroches, *Nouveau dictionnaire françois-flamand et flamand-françois* (Ghent, 1805); Olinger, *Nouveau dictionnaire françois-flamand* (Mechlin, 1834). On modern Flemish literature see Ida von Düringsfeld, *Von der Schelde bis zur Maas* (3 vols., Leipsic, 1861).

FLEMMING, Paul, a German poet, born at Hartenstein in October, 1609, died in Hamburg, April 2, 1640. He was the son of a clergyman. His medical studies in Leipsic being interrupted by the thirty years' war, he accompanied the envoy of Duke Frederick of Gottorp-Holstein to Russia and Persia, married the daughter of an Estonian merchant, and shortly before his death received his medical diploma at Leyden. He belonged to the Silesian school of lyrical poets, and in some respects eclipsed even Opitz. His *Geistliche und weltliche Poemata* (Jena, 1642) and his eloquent hymn *In allen meinen Thaten* rank among his finest productions. Selected editions of his works have been published in Stuttgart (1820) and in Müller's collection of German poets of the 17th century (Leipsic, 1822). His posthumous Latin poems and his pastoral entitled *Margenis* were published by Lappenberg in Stuttgart in 1863.

FLENSBURG, or **Flensburg**, a seaport and market town of the Prussian province of Schleswig-Holstein, at the head of Flensburg fiord, an inlet of the Baltic, 20 m. N. N. W. of Schleswig; pop. in 1871, 21,325. It is the most populous town and the chief commercial mart of the former duchy of Schleswig. It manufactures sugar, tobacco, paper, soap, and iron, has breweries and distilleries, and builds ships for the West India trade. Railways connect it with the principal towns of the province, and with Kolding in Jutland, and steamships with Stettin and other ports of the Baltic. The harbor is deep enough for large craft, but is difficult of entrance. About 200 vessels, many of which are employed in the Greenland whale fishery, are owned here. The number

of entrances in 1869 was 2,211. Flensburg was a wealthy town as early as the 12th century, but it afterward suffered much from wars and conflagrations.

FLETCHER, Andrew (commonly called Fletcher of Saltoun), a Scottish author, born in Saltoun, East Lothian, in 1653, died in London in 1716. He was educated under the care of Gilbert Burnet, then minister of the parish of Saltoun, and spent several years in travel on the continent. In 1681 he obtained a seat in the Scottish parliament for his native county, and distinguished himself by his inflexible opposition to the tyrannical tendencies of the English government. He soon found it necessary to withdraw to Holland, was then summoned before the privy council at Edinburgh, and failing to appear was outlawed, and his estate confiscated. He accompanied the expedition of the duke of Monmouth to England in 1685, but immediately went abroad again in consequence of shooting the mayor of Lyme-Regis in a scuffle. In Spain, on the application of the British ambassador, he was imprisoned, but escaped by the aid of an unknown friend; and in Hungary he gained distinction as a volunteer in the army against the Turks. At the Hague he was prominent in forwarding the scheme of the revolution of 1688, which restored him to his country. He soon recovered his estate and resumed his seat in the Scottish parliament, but became as vehement an opponent of the government of William as he had been of that of his two predecessors. He exerted himself to the last against the union of the two kingdoms, and because the 12 "limitations" which he proposed failed to be adopted he retired from public life. He possessed fine scholarly accomplishments, and his writings sometimes display a high degree of literary excellence. The principal of them are: a "Discourse of Government with Relation to Militias" (Edinburgh, 1698); two "Discourses concerning the Affairs of Scotland" (Edinburgh, 1698); *Discorso delle cose di Spagna* (Naples, 1698); "Speeches," &c. (Edinburgh, 1703); and an "Account of a Conversation concerning a Right Regulation of Governments for the Common Good of Mankind" (Edinburgh, 1704). His collected writings were published at London in 1 vol. 8vo in 1787, and an essay on his life and writings, by the earl of Buchan, appeared in 1797.

FLETCHER, I. Giles, an English poet, cousin of Fletcher the dramatist, born about 1580, died at Alderton, Suffolk, in 1628. He was educated at Trinity college, Cambridge, and became rector of Alderton, where his life passed with little variety of incident. The single poem which he left, entitled "Christ's Victory and Triumph" (Cambridge, 1610), has peculiar and original beauties, with many of Spenser's characteristics. **II. Phineas**, a poet and clergyman, brother of the preceding, born about 1584, died at Hilgay, Norfolk, about 1650. After being educated at Eton and Cambridge,

he was presented in 1621 to the living of Hilgay, which he retained till his death. He wrote "Piscatory Eclogues" and a drama called "Sicelides," but his chief work is a poem entitled "The Purple Island" (Cambridge, 1633), an anatomical and allegorical description of the human body and mind. The poem is given entire in Southey's "Early English Poets." These brothers were disciples of Spenser, and influenced the style of Milton.

FLETCHER, John. See BEAUMONT AND FLETCHER.

FLETCHER, John William (originally Fléochière, Jean Guillaume de la), a clergyman of the church of England, born at Nyon, Switzerland, Sept. 12, 1729, died at Madeley, England, Aug. 14, 1785. Of a noble Savoyard family, he was educated at the university of Geneva. Through inability conscientiously to conform to the Calvinistic doctrines of the Reformed church, he was diverted from the clerical profession, and entered the military service of Portugal. Receiving a captain's commission for Brazil, but accidentally failing to sail at the time appointed, he accepted a commission in the Dutch army and set out for Flanders. Peace having been declared meantime, he went to England and became a tutor. About 1755 he joined the Methodist society. In 1757 he took orders in the church of England, and three years later was presented with the living of Dunham, which he declined, since "it afforded too much money for too little work," and the poor parish of Madeley became his field of labor. In this region of mines and manufactories, among a most debased and neglected people, he continued his labors of charity and devotion in the midst of opposition and persecutions. In 1769 Fletcher visited France, Switzerland, and Italy. Soon after his return, in addition to his parish labors, frequent preaching, and visits to London, Bristol, Bath, Wales, and Yorkshire, he assumed the presidency of the theological school founded by Lady Huntingdon at Trevecca, Wales; but his defence and advocacy of Arminianism soon resulted in sundering his connection with it. He afterward devoted his life to the elevation of his parishioners, to missionary journeys throughout the kingdom in company with Wesley, Whitefield, and their coadjutors, and to the preparation of those controversial writings in which the peculiar doctrines and policy of Wesley were defended against the works of Toplady, Rowland Hill, and others. His works have passed through several editions in England and also in America; the last being issued by the New York Methodist book concern, in 4 vols. 8vo.

FLEURUS, a town of Hainaut, Belgium, near the left bank of the Sambra, 7 m. N. E. of Charleroi; pop. in 1866, 4,098. It has been the scene of four great battles. The first took place Aug. 29, 1622, between the Spaniards under Gonzales of Cordova and the army of the Protestant union under Christian of Brunswick and Count Mansfeld, the victory being

claimed by both sides; the second, July 1, 1690, between the French under Marshal Luxembourg and the Germans under the prince of Waldeck, the latter being defeated; the third, June 26, 1794, when the republican French general Jourdan defeated the imperialists under the prince of Coburg; and the fourth, generally known as the battle of Ligny, in which Blücher was worsted by Napoleon, June 16, 1815.

FLEURY, André Hercule, cardinal de, a French prelate and statesman, born in Lodève, June 22, 1653, died in Paris, Jan. 29, 1748. He was educated at a Jesuit college in Paris, and was appointed almoner to the queen Marie Thérèse, then to Louis XIV., who unwillingly promoted him to the bishopric of Fréjus in 1698, at the request of the archbishop of Paris. On the king's death the regent appointed him preceptor to Louis XV., then about five years old. On the death of the regent in 1723 he advised the young king to take the duke de Bourbon as first minister, reserving for himself a seat in the privy council, and the dispensation of ecclesiastical preferments. In 1726 he caused the duke de Bourbon to be dismissed, and, notwithstanding he was himself in his 73d year, assumed supreme power, with the title of minister of state and superintendent of the general post office. In the same year he was created a cardinal. Under his administration France was generally at peace, the disorders of the past reign disappeared, reforms were made in the government, arts and sciences were fostered, and the country enjoyed comparative prosperity at home. But abroad she lost her high place in the councils of Europe, her army degenerated, her navy decayed, and toward the close of his life the cardinal was charged with involving France in the war of the Austrian succession, which had been begun against his wishes, and up to the time of his death had been little more than a series of disasters for his country. He sought to introduce into the public administration the frugality practised in his own household; and with all his opportunities for emolument, he died poor.

FLEURY, Claude, abbé, a French ecclesiastical writer, born in Paris, Dec. 6, 1640, died July 14, 1723. For nine years he followed the legal profession, giving much attention to literary and historical pursuits. In 1672, having received orders, he became preceptor to the sons of the prince de Conti. In 1674 he published *L'Histoire du droit français*; in 1678, a Latin translation of Bossuet's *Exposition de la foi catholique*; from 1681 to 1683, *Les mœurs des Israélites*, *Les mœurs des Chrétiens*, and *Le grand catéchisme historique*, three excellent little books which he had prepared for the use of his pupils; and in 1687, *L'Institution du droit ecclésiastique*. In 1685 he accompanied Fénelon to Saintonge, and in 1689 Fénelon procured his appointment as his assistant in the education of the dauphin's son. In this employment he remained 16 years, during which he was also engaged on his *Histoire*

ecclésiastique, the first volume of which appeared in 1691. He spent 30 years in bringing this work down to the beginning of the 16th century. It ranks among the most candid histories of Christianity.

FLICKER. See WOODPECKER.

FLIEDNER, Theodor, a German clergyman and philanthropist, born at Eppstein, Rhenish Prussia, Jan. 21, 1800, died at Kaiserswerth, Oct. 4, 1864. In 1822 he became pastor of the congregation at Kaiserswerth, to which his father had ministered until his death in 1813. Soon after his settlement his parishioners were suddenly impoverished by the failure of a manufacturing firm which had employed most of them. Refusing to take another church, he set himself the task of relieving his people, and visited the philanthropic institutions of other countries, particularly those of England. On his return he founded at Kaiserswerth an institution for the relief of the sick, the poor, and the fallen. In 1826 he founded a German society for the improvement of prison discipline, and in 1838 an asylum for discharged female convicts. This asylum at first consisted only of a summer house in his garden, which soon proved too small, and was exchanged for a more substantial edifice. His next idea was to re-establish the ministry of women in the Protestant church, and in 1836 he inaugurated the institution of deaconesses which is still flourishing at Kaiserswerth. "We had no money wherewith to buy the house," writes Fliedner; "my wife had been confined only three days before; but nevertheless she laid it upon me, in the name of the Lord, to buy the house, and the sooner the better. I bought it cheerfully on the 20th of April, 1836. The money was to be paid before Martinmas of the same year." The money was paid before that time, although the price was more than \$1,600—a large sum for that country and class. Two friends, single women, who offered themselves for nursing in the hospital, were the first Kaiserswerth deaconesses. In 1838 Fliedner first sent out deaconesses to work in other places. In 1849 he visited the United States, and established a "mother house" at Pittsburgh, Pa. (See DEACONESS.) He also established at Kaiserswerth a lunatic asylum, a boys' school, and training colleges for schoolmasters and schoolmistresses, training his deaconesses as teachers in all of them. He himself frequently taught in them, and is said to have been fond of striking and often laughable illustrations, such as falling on the floor when telling the story of Goliath, or suddenly sending a boy under the table to represent the fall of a traveller over a precipice. De Liefda says that when he visited the Kaiserswerth establishment in 1864 it took him three hours to walk over the premises and peep into the principal apartments. From 1836 Fliedner published a monthly called *Der Armen- und Krankenfreund*, and was the author of *Buch der Märtyrer und anderer Glaubenszeugen der evangelischen Kirche von den*

Aposteln bis auf unsere Zeit (4 vols., 1852-'60).—See Winkworth's "Life of Pastor Flidner" (London, 1867).

FLINDERS, Matthew, an English navigator, born at Donington, Lincolnshire, about 1760, died July 19, 1814. In 1795 he was midshipman on board the vessel which conveyed Capt. Hunter, the governor of Botany Bay, to Australia. At Port Jackson he embarked with the surgeon of the ship, George A. Bass, in a boat 8 ft. long, in which they explored the estuary of George's river. Their discoveries determined them to explore the whole Australian coast. In a large decked boat with six men, sailing S. through a passage afterward named Bass strait, they first discovered that Tasmania was a separate island. In July, 1801, Flinders, now a captain, again sailed from England, surveyed the whole Australian coast as far as the eastern extremity of Bass strait, then refitted at Port Jackson, and in the summer of 1802, steering N., explored Northumberland and Cumberland islands, and surveyed the Great Barrier reef of coral rocks. He then returned to Port Jackson, where his vessel was condemned, and, unable to procure another, he embarked as a passenger on a store ship to lay his charts and journals before the admiralty, and to obtain another ship to continue his examination of Australia. On the way to England the store ship and a consort were wrecked on a coral reef. Flinders and two or three companions went in an open boat 750 m. to Port Jackson, where he secured a schooner of 29 tons, in which, accompanied by another schooner, he returned and rescued the wrecked crews. He now determined to go to England in the small schooner; but on his way, having made the Isle of France, he was seized by the governor, in spite of a French passport, and was detained for six years; after which his health was so impaired, and his spirit so broken, that he expired in London on the day when his narrative was published ("Voyage to Terra Australis, &c., in the Years 1801, 1802, and 1803," 2 vols. 4to, London, 1814).

FLINT, a peculiar amorphous variety of nearly pure quartz, found in chalk, in nodular masses or in layers, sometimes forming beds of such extent as to be used for building, as in the counties of Kent, Suffolk, and Norfolk, England. It is usually of a dark color from the presence of carbonaceous matter, supposed to be derived from animal remains; but some specimens are almost white and transparent. It breaks with a smooth conchoidal fracture, and very sharp edges may be formed upon it with a hammer; a quality which adapts it for being made into gun flints and arrow and spear heads. Its specific gravity is 2.59. Berzelius found in a specimen 0.117 per cent. of potash, 0.113 of lime, and traces of iron, alumina, and carbonaceous matter. According to Fuchs, the silica is partly soluble. It was formerly thought essential in the production of flint glass, but is now superseded by pure granular quartz or sand. It is still used in the manufacture of

porcelain. Flint nodules constitute a peculiar feature in the chalk cliffs of the coast of England. They occur in horizontal layers scattered through the upper portion of the chalk formation, and in a few instances have been seen in vertical rows like pillars, at irregular distances, the nodules not being in contact either in the horizontal or vertical arrangement. They commonly contain a nucleus of parts of marine fossils, such as are abundant in the chalk, as shells, sponges, echini, &c.; and they also present the forms of hollow geodes, their cavities lined with quartz crystals, iron pyrites, carbonate of iron, chalcedony, &c.—Flint is a common mineral production in the United States, but it is converted to no use. It abounds in the tertiary formations of the southern states, and is met with in the older rocks, even to the metamorphic quartz associated with the lowest stratified rocks. On the Lehigh mountain in Pennsylvania, at Leiber's Gap, is exposed in loose fragments in the soil a vast amount of flint rock, associated with cherty quartz incrustated with chalcedony and mammillary and botryoidal crystallizations. In the woods west of the road 20 acres have been dug over by the Indians, to obtain the flint for arrow and spear heads. Piles of broken flint still lie uncovered by the sides of the excavations. The stone was highly prized by the Indians, and they worked it skilfully.

FLINT, a city and the capital of Genesee co., Michigan, on both sides of Flint river, near the centre of the county, about 60 m. N. N. W. of Detroit; pop. in 1850, 1,670; in 1860, 2,950; in 1870, 5,386. The city is picturesquely situated, and is laid out with broad streets shaded with fine trees. The principal public buildings are the court house, a handsome brick structure surmounted by a cupola; the county jail, built principally of iron; the city hall, of brick; St. Paul's Episcopal church, in the Gothic style, of stone quarried in the vicinity; five ward school houses, three of brick and two of wood, and a handsome Catholic school house, recently erected. A high school building, to cost \$80,000, and a masonic temple are in course of erection. The Michigan institution for the education of the deaf and dumb and the blind occupies a commanding site on the S. W. side of the city, with groves and gardens covering 94 acres. The number of inmates is about 800, nearly equally divided between the blind and the deaf mutes. In the S. E. part of the city, are the fair grounds of the Genesee county agricultural society, 25 acres in extent. The city is at the intersection of the Flint and Pere Marquette with the Chicago and Lake Huron railroads. The most extensive manufacture is that of lumber, which employs 10 saw mills, with an aggregate capacity of 100,000,000 feet annually. There are also seven planing mills, three extensive sash, door, and blind factories, and two flouring mills, producing 25,000 barrels of flour a year. The other principal man-

ufactures are mill and steam machinery, agricultural implements, carriages, cabinet ware, and woollens; 77,360 yards of cloths, cassimere, and flannels were produced in 1872. There are two national banks and a savings bank. The Flint scientific institute has a valuable library and a cabinet embracing several thousand specimens of natural history. The ladies' library association has about 2,000 volumes. Three weekly newspapers are published. In 1872 there were 20 public schools, with 25 teachers and an average attendance of 1,086 pupils. There are eight churches.—The first log cabin on the site of Flint was built in 1819, but the actual settlement dates only from 1830. The city was incorporated in 1855, and in 1871 it was enlarged by annexation, so that in 1878 the population was about 9,000.

FLINT. *I. Austin*, an American physician, born in Petersham, Mass., Oct. 20, 1812. He was educated at Amherst and Harvard colleges, and graduated M. D. at Harvard in 1833. After practising successively in Boston and Northampton, he removed in 1836 to Buffalo; in 1844 was appointed professor of the institutes and practice of medicine in the Rush medical college at Chicago; resigned after one year, and in 1846 established the "Buffalo Medical Journal," which he edited for ten years. In connection with Professors White and Hamilton he founded in 1847 the Buffalo medical college, in which he was for six years professor of the principles and practice of medicine and of clinical medicine. From 1852 to 1856 he filled the chair of the theory and practice of medicine in the university of Louisville, Ky., and then accepted a professorship of pathology and clinical medicine in Buffalo. His essays "On the Variations of Pitch in Percussion and Respiratory Sounds," and "On the Clinical Study of the Heart Sounds in Health and Disease," received the first prizes of the American medical association in 1852 and 1859. A translation of the former of these and of his clinical reports appeared in Paris in 1854. From 1858 to 1861 he spent the winters in New Orleans as professor of clinical medicine in the school of medicine and visiting physician to the charity hospital. In 1859 he removed to New York, where two years later he was appointed visiting physician to the Bellevue hospital, professor of the principles and practice of medicine in the Bellevue hospital medical college, and of pathology and practical medicine in the Long Island college hospital. He has published "Clinical Reports on Continued Fever" (Buffalo, 1852); "Clinical Report on Chronic Pleurisy" (1858); "Clinical Report on Dysentery" (1853); "Physical Exploration and Diagnosis of Diseases affecting the Respiratory Organs" (1856; 2d ed., 1866); "Practical Treatise on the Pathology, Diagnosis, and Treatment of Diseases of the Heart" (1859; 2d ed., 1870); and a "Treatise on the Principles and Practice of Medicine" (1866). This work has been highly successful,

and has passed through four editions, the last of which appeared in 1878. In 1872 Dr. Flint was elected president of the New York academy of medicine. *II. Austin, jr.*, an American physician, son of the preceding, born in Northampton, Mass., March 28, 1836. He attended medical lectures in 1854-'6 at the university of Louisville, Ky., and afterward at the Jefferson medical college in Philadelphia, where he took his degree in 1857. For the next two years he resided in Buffalo, where he became editor of the "Buffalo Medical Journal," and was appointed attending surgeon to the Buffalo city hospital, and professor of physiology and microscopical anatomy in the medical department of the university of Buffalo, delivering one course of lectures in 1858-'9. He then removed with his father to the city of New York, and was almost immediately appointed professor of physiology in the New York medical college. In 1860 he accepted the chair of physiology in the New Orleans school of medicine. The following spring he visited Europe for professional study, following the courses and receiving the special instruction of Robin and Claude Bernard. In 1861, on the organization of the Bellevue hospital medical college in New York, he was appointed professor of physiology and microscopic anatomy in that institution, which position he still holds (1874). He was also for several years professor of physiology in the Long Island college hospital at Brooklyn. Besides attaining an extensive and thorough acquaintance with the literature of physiology, he has made many original experiments and observations, and has largely contributed to the advancement of the science by important articles in the medical journals and by separate publications. His article on "A New Excretory Function of the Liver," in the "American Journal of the Medical Sciences" for October, 1862, received in 1869 an honorable mention and a recompense of 1,500 francs from the committee of the French academy of sciences on the Monthyon prize of medicine and surgery. His most important work is "The Physiology of Man," to be completed in five volumes, of which four have appeared, viz.: vol. i., on "The Blood, Circulation, and Respiration" (New York, 1866); vol. ii., "Alimentation, Digestion, Absorption, Lymph, and Chyle" (1867); vol. iii., "Secretion, Excretion, Ductless Glands, Nutrition, Animal Heat, Movements, Voice, and Speech" (1870); vol. iv., "On the Nervous System" (1872). He has also published a "Manual of Chemical Examination of the Urine in Disease" (1870).

FLINT, Timothy, an American clergyman and author, born in North Reading, Mass., July 11, 1780, died in Salem, Aug. 16, 1840. He graduated at Harvard college in 1800, entered the ministry of the Congregational church, and settled at Lunenburg, Mass., in 1802. He was a diligent student of the natural sciences, and his chemical experiments led some ignorant per-

sons to charge him with counterfeiting coin. He prosecuted them for slander; an ill feeling increased by political differences sprang up between him and his parishioners, and he resigned his charge in 1814. He then preached in various parts of New England, and in September, 1815, set out for the west as a missionary, and passed seven or eight years in the Ohio and Mississippi valleys. In 1825 he returned to Massachusetts, broken in health, which the change of climate soon restored. His first work was "Recollections of Ten Years passed in the Valley of the Mississippi" (8vo, Boston, 1826), which was reprinted in London, and translated into French. In the same year he brought out a novel, "Francis Berrian, or the Mexican Patriot." His next publication was a "Condensed Geography and History of the Western States in the Mississippi Valley" (2 vols. 8vo, Cincinnati, 1828), forming with the "Recollections" one of the best accounts of that region ever written. In 1828 he removed to Cincinnati, where he edited for three years the "Western Review." In 1833 he went to New York and conducted a few numbers of the "Knickerbocker Magazine." He afterward took up his residence in Alexandria, Va., spending most of his summers in New England. His writings are spirited and powerful, but somewhat wanting in polish. His principal works, besides those mentioned above, are: "Arthur Olenning," a novel (2 vols. 12mo, Philadelphia, 1828); "George Mason, or the Backwoodsman;" "Shoshonee Valley" (3 vols. 12mo, Cincinnati, 1830); a translation of Droz, "Essay upon the Art of Being Happy" (Boston, 1832); "Indian Wars in the West" (12mo, 1833); "Lectures on Natural History, Geology, Chemistry, and the Arts" (12mo, Boston, 1833); and "Memoir of Daniel Boone" (18mo, Cincinnati, 1834). He also contributed to the London "Athenæum" in 1835 a series of papers on American literature.

FLINT RIVER (Indian name, *Thronateeska*), a river of Georgia, rising in the N. W. part of the state, near Fayetteville, flowing S., and uniting with the Chattahoochee at the S. W. extremity of the state, to form the Appalachicola. It is about 300 m. long, and is navigable to Albany, 250 m. from the gulf of Mexico.

FLINTSHIRE, a N. E. county of Wales, consisting of two separate portions, lying at a distance of 8 m. from each other, with a part of Denbighshire between them, the larger portion bordering on the Irish sea and the estuary of the Dee; aggregate area, 289 sq. m.; pop. in 1871, 76,245. It is the smallest but, in proportion to its extent, most populous county in Wales. The surface near the coast is low, and elsewhere is diversified, though there are no great elevations. A range of hills runs alongside the S. W. boundary, and a branch of them traverses the county in a N. E. direction. Between these ridges are fertile valleys, including the well known vale of Clwyd, watered by several rivers, which flow on the one side into the

Clwyd and Alyn, and on the other into the Dee, which forms the N. E. boundary. The greater part of the county rests upon the coal measures, which exist chiefly on the coast of the estuary of the Dee. In 1867 there were 40 collieries and 45 lead mines in the county. The principal smelting works are at Mold and Holywell. The other minerals are copper, iron, zinc, and calamine. Agriculture employs about 8 per cent. of the population. Wheat and rye are principally cultivated, and considerable quantities of butter and cheese are made. The shipping trade is not extensive, as the ports are accessible only to small craft. The Chester and Holyhead railway traverses the county, and the Chester and Mold railway penetrates to its centre. The chief towns are Mold, the capital, Flint, St. Asaph, Holywell, Rhyddlan, Hawarden, and Bagilt.

FLOATING ISLANDS. An early notice of this phenomenon is recorded in an interesting letter of the younger Pliny to Gallus, in which he describes the appearance of a number of floating islands in the Lacus Vadimonis, now Laghetto di Bassano, near Rome. They were covered with reeds and rushes, and the sheep grazing upon the borders of the lake passed upon them to feed, and were often floated away from the shore. On a lake near Gerdauen, in East Prussia, the extent of such islands is said to be sufficient for the pasturage of 100 head of cattle; and on one in Lake Kolm, near Osnabrück, are many fine elms. These islands are produced by accumulations of drift wood, among which drifting sands and earth collect and form a soil, in which plants take root and flourish. The great "rafts" of some of the western rivers are of this nature; for the most part these do not float from place to place, but masses are occasionally detached and drift out from the mouth of the Mississippi, carrying the birds, serpents, and alligators that had taken refuge upon them. Such islands have been seen floating 100 miles off from the mouth of the Ganges, from which they had been discharged. On the great rivers of South America they are very often met with, carrying the prolific productions of the vegetable and animal life of the tropics, and depositing them in new localities. Thus they may have been the means of distributing species of the larger animals among the islands of the south Pacific, upon many of which their introduction by any other mode is difficult to account for. Prescott describes the floating gardens or *chinampas* of Mexico as an archipelago of wandering islands. The primitive Aztecs adopted the plan suggested by these natural objects, and covered rafts of woven reeds and rushes with the fertile sediment drawn up from the lake. Upon these gardens, gradually extending to 200 or 300 feet in length, the Indians cultivated flowers and vegetables for the market of Tenochtitlan. Some of the *chinampas* were firm enough to sustain small trees and a hut, and could be moved about with a pole or fastened to it at

the will of the owner. Remarkable floating islands occur in the Malay archipelago.

FLODDEN FIELD, Battle of, fought Sept. 9, 1513, between the Scots under King James IV. and the English under the earl of Surrey. Henry VIII. was on the continent engaged in his expedition against France when the border feuds broke into open war. James crossed the Tweed, Aug. 22, at the head of the feudal array of his kingdom, captured four border fortresses, and encamped, Sept. 6, on Flodden, the last of the Cheviot hills, in Northumberland, 8 m. S. E. of Coldstream. The earl of Surrey, to whom was intrusted the defence of the English border, summoned the gentlemen of the northern counties to join him at Newcastle, and reached Alnwick Sept. 3, with 26,000 men, where he offered battle to James in a message sent by a pursuivant-at-arms. By a skilful countermarch he placed himself on the morning of Sept. 9 between James and Scotland. The battle began between 4 and 5 o'clock P. M., and was decided in little more than an hour. The Scottish army, setting fire to its tents, descended the ridge of Flodden to secure the eminence of Brankstone, and was met by the English army, which advanced in four divisions under the command of Surrey, his two sons, Thomas and Sir Edmund Howard, and Sir Edward Stanley. Earls Huntley and Home, who led the Scottish left wing, charged the Howards so successfully with a body of spearmen that Sir Edmund was unhorsed and his division put to flight. The battle was restored in this quarter by the advance of Lord Dacre with the reserve of cavalry. On the right wing the highlanders were unable to stand against the severe execution of the Lancashire archers. James, surrounded by some thousands of chosen warriors, charged upon Surrey in the centre of his army with such resolution as to penetrate within a few yards of the royal standard, when he was attacked in the flank and rear by Stanley, already victorious over the Scottish right. James fell by an unknown hand within a lance's length of Surrey, and all of his division perished with their king, not one of them being made prisoner. Before dawn the Scots abandoned the field in disorder. Their loss was about 10,000 men, which included the prime of their nobility, gentry, and even clergy. "Scarce a family of eminence," says Scott, "but had an ancestor killed at Flodden, and there is no province of Scotland, even at this day, where the battle is mentioned without a sensation of terror and sorrow." The English lost about 7,000 men. Scott's "Marmion, a Tale of Flodden Field," contains in the last canto an accurate and most animated description of the battle.

FLOOD, Henry, an Irish orator and politician, born in 1732, died Dec. 2, 1791. He was a son of the chief justice of the court of king's bench in Ireland, and was educated at Trinity college, Dublin, and at Oxford. In 1759 he became a member of the Irish house of com-

mons, where his eloquence made a remarkable impression, and his activity in support of all measures beneficial to his country won him great popularity. His relations to the government, however, exposed him to the charge of inconsistency. He was reelected to parliament in 1761, and was made a privy councillor for the two kingdoms, and vice treasurer of Ireland in 1775, but resigned in 1781. In 1788 he held a celebrated discussion with Mr. Grattan in the house of commons. In the same year he was returned to the English parliament for the city of Winchester, and in 1785 he represented Seaford. His speeches were logical, pure in style, and rich in figures and classical allusions. He left a Pindaric "Ode to Fame," and a poem on the death of Frederick, prince of Wales, to be found in the Oxford collection, and published a volume of speeches in 1787. His "Life and Correspondence," by W. Flood, was published in London in 1888.

FLORA, the Roman goddess of flowers and spring. She was worshipped in Rome from the very earliest time. Her temple stood near the *circus maximus*; and her festival was celebrated annually on the last three days of April.

FLORENCE (Ital. *Firenze*). I. A province of central Italy, included in Tuscany, bordering on Modena, Bologna, Ravenna, Forli, Pesaro ed Urbino, Arezzo, Siena, Pisa, and Lucca; area, 2,268 sq. m.; pop. in 1872, 766,326. It comprises the four districts of Florence, Pistoja, Rocca San Casciano, and San Miniato. The principal chain of the central Apennines traverses the E. part of the province. Other detached mountains extend into the E. and S. parts. The remainder is partly hilly and partly level. The principal river is the Arno, which receives a considerable number of affluents. Agriculture is flourishing in the numerous valleys, and the wine in the vicinity of the city of Florence is the best of Tuscany. Other branches of industry are cattle breeding, the cultivation of the olive, fishing, and mining.

II. A city, capital of the province and formerly of the grand duchy of Tuscany, in lat. 43° 46' 36" N., lon. 11° 15' 30" E., 194 m. S. E. of Turin, 140 m. N. N. W. of Rome, and 250 m. N. N. W. of Naples; pop. in 1872, 167,098. Of late the area of the city has been considerably increased by the extension of the suburbs, and while Florence was the capital of Italy (1865-'71) the population is believed to have considerably exceeded 200,000; but since the transfer of the seat of government to Rome it has rapidly decreased. The city lies in a beautiful, well wooded, well cultivated valley, surrounded by the Apennines. It was encircled by an old wall 5 or 6 m. long, with 8 gates, but the wall was demolished in 1873. The river Arno flows through it, the larger part of the city being on the right or N. bank. The river within the city is crossed by four fine stone bridges, of which the most noted is the Ponte di Santa Trinità, built in 1566-'70. It is adorned with statues, is 323 ft. long, and the central arch

has a span of 96 ft. This bridge is a favorite evening walk of the people. The Ponte Vecchio is 75 ft. wide, and the carriageway in the middle is lined on each side by a row of shops, occupied chiefly by goldsmiths and jewellers. There are also two suspension bridges. In the older parts of the city the streets are narrow and irregular, and the houses for the most part meanly built; but the newer and larger portions are very handsome and stately, and the streets wider than is common in the cities of southern Europe, and solidly paved with blocks of stone. The churches of Florence are 172 in number, and many of them of great size and antiquity; but few are completely finished, and their general appearance is neither elegant nor picturesque. The Duomo, or cathedral church of Santa Maria del Fiore, is a vast and superb structure, which is surpassed in archi-

tectural grandeur only by St. Peter's at Rome. The decree for its erection was issued in 1294, and its foundations were laid in 1298; the great dome was erected by Brunelleschi in the 15th century, but the facade was not completed till the middle of the 17th. The length of the building is nearly 500 ft., and of the united transepts 806 ft.; its height from the pavement to the summit of the cross is 387 ft.; the height of the nave is 153 ft., and of the side aisles 96½ ft., and the width of the nave and aisles is 128 ft. The exterior of the church is covered throughout with red, white, and black marble, disposed in panels and variegated figures; and the pavement is also of many-colored marble, much of which was laid under the direction of Michel Angelo. The dome of this cathedral is the largest in the world, its circumference being greater than that of the dome of St.

General View of Florence.

Peter's, and its comparative height greater, though its base is not placed so high above the ground. It excited the admiration of Michel Angelo, to whom it served as a model for the dome of St. Peter's. This church is richly adorned with statues and pictures, most of which are by eminent masters. Among the statues is an unfinished group by Michel Angelo, representing the entombment of Christ. Among the paintings is a portrait of Dante, executed in 1465. Near the cathedral stands the *campanile* or belfry, which was designed by Giotto, and begun in 1334. It is a square tower, 276 ft. high, light and elegant, in the Italian-Gothic style, and divided into four lofty stories. Charles V. used to say that it deserved to be kept in a glass case. The lower story contains two ranges of tablets, designed by Giotto and executed by him and by Andrea Pisano and

Luca della Robbia. Opposite the principal front of the cathedral stands the baptistery, whose three great bronze portals, adorned with bass reliefs by Andrea Pisano and Ghiberti, were declared by Michel Angelo worthy to be the gates of Paradise. The church of San Lorenzo has attached to it a sacristy which contains seven statues by Michel Angelo. Adjoining the same church is the costly Medicean chapel, begun in 1604 by Ferdinand I., grand duke of Tuscany, as the mausoleum of his family, on which, it is said, \$17,000,000 have been expended. It is an octagon 94 ft. in diameter and 200 ft. high, and is lined throughout with lapis lazuli, jasper, onyx, and other precious stones. The church of Santa Croce, 460 ft. long and 134 ft. wide, whose foundation stone was laid in 1294, is the Pantheon or Westminster abbey of Florence. It contains the

tombs of Michel Angelo, Machiavelli, Galileo, Leonardo Aretino, Guicciardini, Alfieri, Ugo Foscolo (since June 24, 1871), and of many other illustrious men. Florence abounds in palaces of a singularly solid, heavy style of architecture, resembling prisons or fortresses. They were built in ages of turbulence and civil strife, for defence and security rather than for display or luxury. Their great size and height, the rough massiveness of their lower stories, and the huge cornices frowning over their fronts, give them a very impressive appearance. The two principal palaces, the Palazzo Vecchio and the Palazzo Pitti, contain celebrated collections of works of art. The gallery in the Palazzo Vecchio exhibits portraits of many celebrated Florentines, from Cosmo il Vecchio (died in 1464) to Cosmo the first grand duke (died 1574). The Pitti gallery, which is very rich and extensive, contains many of the best works of Michel Angelo, Titian, Salvator Rosa, Andrea del Sarto, Murillo, Rubens, and several of Raphael's, including the celebrated "Madonna della Seggiola." The gallery in the Uffizi is considered one of the choicest and most varied in Europe. It displays in the picture halls a historical series of the Tuscan and Venetian schools, arranged chronologically, and exhibiting the finest specimens of the Italian masters. The French, German, Dutch, and Flemish schools are also richly represented. Among the statues in the room called the tribune are the famous Venus de' Medici, the Apollino, the "Dancing Faun," the "Wrestlers," and the "Knife Grinder." The finest paintings of the entire collection are hung in the tribune. In another hall is a series of portraits of eminent painters, chiefly executed by themselves. The gallery has also a series of busts of the Roman emperors from Cæsar to Constantine, which is unsurpassed except in the Capitoline museum in Rome; and there are halls devoted to sculptures of the 15th and 16th centuries, original drawings of the old masters, engravings, ancient bronzes, medals, gems, cameos, and intaglios, the whole forming one of the finest collections in the world. The library is rich in autographs, letters, and portions of the works of Boccaccio, Poliziano, Machiavelli, Michel Angelo, Tasso, Alfieri, Monti, and others. The Uffizi is connected with the Pitti palace by a passage which crosses the Ponte Vecchio. This is lined with tapestries, paintings, drawings, and engravings, and in the middle of these was once a bathing room connecting with the waters of the Arno. Besides these famous collections, the city abounds in galleries, museums, and choice works of art. The national library, formed in 1864 by the union of the Magliabecchian and the Palatine, contains over 200,000 printed volumes and 14,000 MSS.; the Marucellian 60,000, and the Riccardian 30,000 volumes; and the Laurentian 9,000 MSS. Of the university, which was opened in 1438, nothing but the theological library is now left. There are many literary institutions,

the chief of which was formerly the academy della Crusca, founded in 1582, whose object was the improvement of the Italian language. It is now incorporated with two still older societies in what is known as the royal Florentine academy. There are agricultural and fine-art academies, a medical college, an academy of fine arts for ladies, an athênæum, an Egypto-Etruscan museum of antiquities, a museum of Italian art and manufactures, and 10 theatres. The Boboli gardens, named from a family which once had a house in the vicinity, are divided into endless walks, shady pathways, waters crowned with elaborately sculptured fountains and filled with gold fish, and groves adorned with statues, among which are a Neptune executed in 1565 by Stoldo Lorenzi, Pegasus by Costoli, four large unfinished statues by Michel Angelo which he intended as a part of his monument to Pope Julius II., Apollo and Ceres by Baccio Bandinelli, Paris and Helen by Rossi da Fiesole, and four satyrs and a Venus by Giovanni da Bologna. The academy contains some of the finest examples of early Florentine art, illustrating the lives of the Saviour, the Virgin, saints, martyrs, and apostles, Fra Angelico's "Last Judgment," with many choice works of Bartolommeo, Raphael, Andrea del Sarto, and other masters. The Egypto-Etruscan museum was a convent in the 16th century, and is adorned with frescoes from the pencil of Raphael. For many years it was devoted to secular uses; and in 1826, while the proprietor, a coach builder, was preparing to whitewash the walls of the former refectory, was discovered beneath dirt and coats of whitening the fine fresco of the "Last Supper," in which the border of the dress of St. Thomas bears the autograph of Raphael with the date M.D.V. To this building quite recently have been transferred the Etruscan remains formerly in the Uffizi gallery. This is a most valuable collection of papyri, bassi rilievi, statues, vases, sarcophagi, bronzes, jewelry, pottery, and other relics of great antiquity. The museum of natural history was opened in 1780. Napoleon's sister, Élisabeth Bacciocchi, grand duchess of Tuscany, added a school of public instruction. In 1859 Victor Emanuel founded a school for more advanced studies. The museum is very rich in palæontological, zoological, geological, and mineralogical collections, and is celebrated for its wax preparations exhibiting a complete series of perfect specimens of human and animal anatomy. It contains also a valuable collection of physical and astronomical instruments, among them the telescopes constructed by Galileo. Attached to the building, and adjoining the Boboli gardens, are the botanical gardens, remarkable for rare plants, and for the great number of species, which have increased from 826 in 1842 to more than 120,000 in 1878. A new observatory was opened in 1871 under Donati's direction. The charitable institutions are numerous, including asylums for the blind,

for the deaf and dumb, and for orphans, and an ancient association of the nobles and gentry for the relief of the sick and suffering poor.—The trade of Florence is chiefly in the produce of the surrounding country, oil, wine, and raw silk, and in her own manufactures, of which the principal are silk stuffs, straw hats, artificial flowers, musical and scientific instruments, jewelry, and fine porcelain. The climate is mild and healthy, though the winds from the Apennines cause sudden transitions from heat to cold, frequently in the same day. The city is exempt from specific diseases and epidemics. Foreigners find September, October, and November the most agreeable months for residence, and the spring months are very delightful. The environs are like beautiful gardens, and abound in delightful places for excursions. The Cascine, which takes its name from the dairy to which the extensive pastures and pleasure grounds are annexed, is the chief park of Florence for the display of equestrian and fashionable equipages. The drives are fine, and the surrounding scenery is superb. The people are lively, polite, and intelligent, with a refinement of manner and language which extends even to the lowest classes, whose style of speech is singularly graceful, delicate, and expressive. The climate, the cheapness of living, the galleries of art, and the refinement of the people render Florence a particularly pleasant place of residence, and have attracted to it great numbers of foreigners, especially English and Americans. During the occupancy of the city by the Italian government Florence was one of the gayest capitals in Europe.—Florence was called *Florēntia* by the Romans. It is supposed to have been founded by the dictator Sulla, about 80 B. C.; but it seems to have been of little importance till the later ages of the Roman empire. In 406 it was a considerable city, and was besieged by Radagaisus, at the head of a great army of Vandals, Burgundians, Alans, and other barbarians. Stilicho raised the siege and captured and put to death the barbarian monarch. About the middle of the 6th century it was destroyed by Totila, king of the Ostrogoths. Charlemagne rebuilt it at the end of the 8th, and during the next two centuries it grew in importance, till in the 10th the people acquired the right of electing their own magistrates. The city was governed by a senate of 100 persons, with an executive of four, and afterward of six consuls. In 1207 the chief executive functions were assigned to a single magistrate called the *podestà*. In 1215 the Florentines began to take part in the civil war between the Guelphs and the Ghibellines which convulsed Italy. After a contest lasting for 38 years, the Guelph or papal party was beaten and expelled from the city. A few years later the citizens took arms against the nobles, defeated them, demolished their fortified palaces, and established a democratic government, with two chief magistrates,

one styled "the captain of the people" and the other *podestà*, and various councils chosen from all classes of the population. The feuds between Ghibellines and Guelphs were however renewed, and carried on with varying results. In 1282 the republic adopted a new system of government, which continued unchanged for several centuries. A long series of civil wars between the factions of the Bianchi and Neri (whites and blacks) ensued, in spite of which the city grew very rich and powerful. It became the financial capital of Europe, and its merchants carried on an immense trade with foreign countries. The population amounted to 150,000, and the armed militia, who could be called together by the tolling of a bell, were reckoned at 25,000. In 1342 Gaultier de Brienne, an adventurer who bore the title of duke of Athens, became lord of Florence by a *coup d'état*; but after a year of cruel despotism he was deposed and driven from the city by a sudden insurrection. The anniversary of this revolution, July 26, 1348, is still celebrated at Florence. The republic was restored, and continued to flourish in spite of factions, insurrections, and civil and foreign wars, till the 15th century, when the family of the Medici obtained a controlling influence in its affairs, which resulted in the final overthrow of republican institutions in the 16th century. (See MEDICI, and TUSCANY.) In 1349 Florence was for a short time the seat of a provisional government. It was the scene of a revolution, April 27, 1359; and in March, 1360, the people voted for annexation to Sardinia. It was decreed to be the capital of the new kingdom of Italy, Dec. 11, 1364. Victor Emanuel and his court removed thither from Turin May 13, 1865, and on the day following the 600th anniversary of Dante's birth was celebrated. In July, 1871, the seat of government was transferred to Rome.—Of the older histories of the city, Machiavelli's *Istorie fiorentine*, Nardi's *Storia della città di Firenze*, and Varchi's *Storia fiorentina* are the most important. A "Florentine History," by H. E. Napier (6 vols. 12mo), was published in London in 1846-'7, and a "History of the Republic of Florence," by Adolphus Trollope, in 1864. For descriptions of Florence see "European Capitals," by William Ware (Boston, 1851), "Six Months in Italy," by George S. Hillard (6th ed., Boston, 1858), and "Walks in Florence," by Susan and Joanna Horner (2 vols. 12mo, London, 1878).

FLORENCE, Council of, the 16th general council of the church, according to Roman Catholic theologians. It was convened in Ferrara by Eugenius IV. for the purpose of reuniting the eastern and western churches. The first session was held in Ferrara Jan. 10, 1438, Nicholas Albergati presiding as cardinal legate. The pope himself opened the second session, Feb. 15, and on March 10 the Greek emperor John VI. or VII. was present, with the patriarch of Constantinople and a number of eastern prelates. The

public discussion of the doctrinal differences between the churches commenced the next day, and was continued without any satisfactory result until the breaking out of the plague obliged the pope, Jan. 10, 1439, to transfer the council to Florence. The number of prelates from the East particularly had been now more than trebled, and the emperor, whose power was daily undermined by the advance of the Mussulmans, urged the bishops to come to an understanding. At length, on June 8, a doctrinal agreement was reached on the procession of the Holy Ghost, and the addition to the Nicene creed of the words *Filioque*, and it was signed by all present. Another month's continuous debating brought both parties to an agreement on the remaining points, viz.: purgatory, the use of unleavened bread in the eucharist, and the primacy of the bishop of Rome. On July 6, the pope officiating, and the Greek emperor being present with his bishops, the solemn doctrinal decree on which both East and West agreed was promulgated by Cardinal Cesarini. The emperor and the eastern prelates took their departure from Florence Aug. 26; but the sessions continued, to afford the other eastern communions an opportunity of ratifying what was done. A decree of union with the Armenian church was published on Nov. 22, and another with the Jacobites of Abyssinia on Feb. 5, 1441. Canonists are generally agreed in considering this council to have ended in the solemn session of April 26, 1442. The two supplementary sessions held afterward in Rome had for their object the reunion of the Syrians, Chaldeans, and Maronites, for which preliminary steps had been taken in Florence.

FLORES, the westernmost of the Azore islands in the N. Atlantic ocean; lat. $39^{\circ} 25' N.$, lon. $31^{\circ} 12' W.$; length 30 m., breadth 9 m.; pop. in 1864, 10,522. Its name was given it by the Portuguese in allusion to the multitude of flowers with which it appeared to be adorned. Chief towns, Lages and Santa Cruz.

FLORES, Floris, Endé, or Mangarai, an island of the Malay archipelago, N. W. of Timor, between lat. 8° and $9^{\circ} 10' S.$, and lon. $119^{\circ} 50'$ and $123^{\circ} E.$; length E. and W. about 200 m., average breadth 45 m. The strait of Flores on the east separates it from the islands of Solor and Adenar. It has a hilly surface, and like all the islands of the same chain is of volcanic formation. There are several active craters, one of which is 7,000 ft. high. The island produces copper, according to native accounts, and also gold and iron, but not sufficient to be profitably worked. The forests yield sapan wood and dye wood; rice, maize, edible roots, and a good species of cotton, are cultivated. Cotton is exported to Celebes. The other principal articles of trade are benzoin, ambergris, beeswax, slaves, and ships' provisions, payment for which is made in cutlery, gunpowder, glassware, and linen. The natives are divided into a number of dis-

tinct nations, all speaking different languages. The principal towns are Endé, with about 200 houses, which has a large and safe harbor; Mangarai on the N. coast; Pota on the same side, the site of a Dutch fort and trading post; and Larantuka on the S. E., where the Portuguese have a small settlement.—The Portuguese visited the island at an early period, and gave it the name of Flores. It was subordinate for a time to the Dutch presidency on Timor island, but in 1812 the Bughis expelled all the European settlers. Christianity has obtained a foothold by the labors of Portuguese missionaries, and the native traders generally sail under the Portuguese flag.

FLORIAN, Jean Pierre Claris de, a French author, born at the château de Florian in Languedoc, March 6, 1755, died in Sceaux, Sept. 13, 1794. His uncle, the marquis de Florian, placed him when 13 years old at Ferney with Voltaire, where he remained three years, when he became page to the duke de Penthièvre, who subsequently procured him a commission in a regiment of cavalry. He left his troop to attach himself as a *gentilhomme de cour* to the duke, at whose residence he pursued his literary avocations. Several of his dramas were performed at the theatre of D'Argental, and on these occasions Florian often played the part of harlequin. Though not the best of his works, some of his plays, as *Les deux billets*, *Le bon père*, *La bonne mère*, &c., have considerable merit, and the first still holds its place on the French stage. In 1783 he produced his *Galatée*, a novel in imitation of the "Galatea" of Cervantes; and in 1786 his *Numa Pompilius*, a classic romance in the style of Fénelon's *Télémaque*. After these appeared *Estelle*, a pastoral tale, *Gonzalve de Cordoue*, with a preliminary sketch of Moorish history, and a collection of fables, which are deemed the best that have been produced in France since La Fontaine's. He wrote also several poems. On the outbreak of the revolution he was consigned to a dungeon, where he finished his poem of *Ephraïm*, and wrote his romance of *Guillaume Tell*. He was liberated after the 9th Thermidor, but soon fell a victim to grief. After his death appeared his translation of "Don Quixote." The best uniform edition of his works is that of Paris in 1820, 16 vols.

FLORIAN, Saint, a German martyr, born at Zeiselmauer, Lower Austria, about the year 190, served as a captain in the Roman army, and was drowned for his adherence to Christianity, near Lorch on the Enns, in 280. According to a legend, he presented himself immediately after his death to a pious woman, whom he requested to bury his remains on the site of the present Augustinian monastery near the village of St. Florian, in the vicinity of Linz. His bones were sent to Rome, and in 1183 to Poland, of which country he became the patron saint. His anniversary is celebrated Aug. 4; and on account of the emblems by which he is represented, his protection is often

invoked against conflagrations. The monastery of St. Florian, said to have been founded in 455 by St. Severin, contains a magnificent church, organ, and bell, a library of 40,000 volumes, a numismatic and other collections, and a pleasant garden and horticultural school. The adjoining Tilly castle has belonged to it since 1686.

FLORIDA, the southernmost state of the American Union, and the 14th admitted under the federal constitution, situated between lat. 24° 30' and 31° N., and lon. 80° and 87° 45' W.; bounded N. by Alabama and Georgia, E. by the Atlantic ocean, S. and W. by the gulf of Mexico and the Perdido river, the latter dividing W. Florida from the gulf section of Alabama; area, 59,268 sq. m., or 87,981,520 acres. The state is divided into 39 counties, viz.: Alachua, Baker, Bradford, Brevard, Calhoun, Clay, Columbia, Dade, Duval, Escambia, Franklin, Gadsden, Hamilton, Hernando, Hillsborough, Holmes, Jackson, Jefferson, Lafayette, Leon, Levy, Liberty, Madison, Manatee, Marion, Monroe, Nassau, Orange, Polk,

one of the best harbors on the southern coast. The population of Florida has been as follows:

YEARS.	White.	Free colored.	Slaves.	Total.
1880	18,885	944	15,501	34,730
1840	27,948	817	25,717	54,477
1850	47,306	989	89,810	87,445
1860	77,746	982	61,745	140,424
1870	96,057	91,659	.. .	167,748

In 1870 the state ranked 38d in point of population. Of the total population, 94,548 were males and 93,200 females; 182,781 were of native birth, of whom 109,554 were born in the state, and 4,967 were foreign born, including 1,155 born in Cuba and 1,101 in other parts of the West Indies. The density of population was 8.17 to a square mile. There were 39,894 families with an average of 4.77 persons to each, and 41,047 dwellings with an average of 4.57 persons to each. Between 1860 and 1870 there was an increase of 38.7 per cent. in the total population: 23.55 per cent. in the white, and 46.29 per cent. in the colored. The number of male citizens 21 years old and upward in 1870 was 38,854. There were in the state 63,897 persons between the ages of 5 and 18 years, including 30,990 colored; the total number attending school was 12,778, of whom 4,524 were colored; 66,288 persons 10 years old and upward were unable to read, and 71,803 could not write. Of the latter, 34,666 were males and 37,132 females; 18,904 were white, and 52,894 colored; 12,786 were from 10 to 15 years of age, 14,678 from 15 to 21, and 44,834 were 21 or over, of whom 3,876 were white males, 5,600 white females, 16,806 colored males, and 18,052 colored females. The number of paupers supported during the year ending June 30, 1870, was 147, at a cost of \$9,830. Of the total number (142) receiving support June 1, 1870, 80 were white and 62 colored. The number of persons convicted of crime during the year was 335. Of the total number (179) in prison June 1, 1870, 28 were white and 156 colored. The state contained 88 blind, 48 deaf and dumb, 29 insane, and 100 idiotic. Of the total population 10 years of age and over (181,119), there were engaged in all occupations 60,708 persons, of whom 50,877 were males and 9,826 females; in agriculture, 42,492, including 81,038 agricultural laborers, and 11,165 farmers and planters; in professional and personal services, 10,897, of whom 197 were clergymen, 4,008 domestic servants, 4,065 laborers not specified, 149 lawyers, 248 physicians and surgeons, and 250 teachers not specified; in trade and transportation, 3,023; in manufactures and mechanical and mining industries, 4,291. The total number of deaths during the year was 2,264. Of these, 730 were from general diseases, including 107 from enteric fever, 45 from yellow fever, 130 from intermittent fever, 84 from remittent fever, 26 from typho-malarial fever, 131 from consump-

State Seal of Florida.

Putnam, St. John's, Santa Rosa, Sumter, Suwannee, Taylor, Volusia, Wakulla, Walton, and Washington. The cities of the state are: Jacksonville, which had 6,912 inhabitants in 1870; Pensacola, 3,343; Tallahassee, the capital, 2,023; and St. Augustine, 1,717. Key West (called by the Spaniards *Cayo Hueso* or Bone Key) is a place of great commercial and military importance. Pensacola, Appalachicola (1,129 inhabitants), and St. Mark's are ports of W. Florida. Cedar Keys, Tampa, and Charlotte Harbor are the principal outlets on the W. side of peninsular Florida. St. Augustine, on the Atlantic coast, is the oldest town in the United States, and is much resorted to by invalids on account of its equable climate. Jacksonville is a thriving commercial city on St. John's river, and likewise a resort of invalids. Fernandina (1,722 inhabitants) is a town at the N. end of Amelia island, and is the Atlantic terminus of the railroad which has its gulf terminus at Cedar Keys. It has

tion, and 71 from dropsy; 383 from diseases of the nervous system, of which 82 were from encephalitis and 188 from meningitis; 129 from diseases of the circulatory system; 385 from diseases of the respiratory system, including 268 from pneumonia; and 393 from diseases of the digestive organs.—Florida, exclusive of islands, consists of a long narrow strip of territory extending S. from Georgia and Alabama from 80 to 90 m., and from the Atlantic ocean to the Perdido river about 360 m.; and of a peninsula extending from the mainland S. through five degrees of latitude between the Atlantic and the gulf of Mexico. Its coast line is of much greater extent than that of any other state, having a length of 472 m. on the Atlantic and 674 m. on the gulf; but this immense stretch of sea front is almost inaccessible on account of shallow soundings, and has few good harbors. S. from the mainland a chain of small rocky islands, called cays or keys, extends S. W., ending in a cluster of rocks and sand banks called the Tortugas. S. of the bank upon which these keys rise, and separated from them by a navigable channel, is a long narrow coral reef known as the Florida reef, which here constitutes the left bank of the Gulf stream. The most important of the keys is Key West. For a long period the haunt of smugglers and pirates, it is now a naval station of great importance, and the seat of a band of wreckers whose business it is to assist vessels in distress. This key is about 6 m. long and 2 broad, with a large, well sheltered harbor. The extensive ponds there yield annually a large amount of salt. The Tortugas derive their name from the vast number of turtles found in the neighboring waters. The most important harbors are: on the gulf coast, Pensacola, Appalachicola, St. Mark's, Cedar Keys, Tampa, Charlotte, and Key West; and on the Atlantic coast, St. Augustine and Fernandina. Jacksonville on St. John's river has also a good harbor.—The rivers of Florida are numerous, and many of them afford great facilities for internal navigation. St. John's river rises in the great southern marsh, and reaches the ocean after a N. course of 800 m. in lat. $30^{\circ} 20' N.$; for nearly 100 m. from its mouth it is a wide sluggish sheet of water, more resembling a lagoon than a river. It is navigable to Lake George, about 100 m., for vessels drawing 8 ft. of water, and nearly to its head for smaller craft. Indian river is a long lagoon on the E. side of the peninsula, and communicates with the ocean by an outlet in lat. $27^{\circ} 30'$. It is proposed to connect these two waters by a short canal, and by this means secure an inland navigation from the mouth of the St. John's to Jupiter inlet, a distance of about 250 m. Charlotte and Amatura are the principal rivers on the W. side, the whole of which S. of the Suwanee contains only small streams. The Suwanee is formed by the Withlacoochee and Allapaha from Georgia, and reaches the gulf at Wacassas bay.

The Ockloconee also rises in Georgia. The Appalachicola, formed on the N. frontier by the junction of the Chattahoochee and Flint, falls into the bay of the same name after a navigable course of about 75 m. The Choctawhatchee, Escambia, and Perdido rise in Alabama and flow S., the first into Choctawhatchee bay, the second into Pensacola bay, and the last into Perdido bay, arms of the gulf of Mexico. The St. Mary's in the N. E. is common also to Georgia; it flows into the Atlantic in about lat. $30^{\circ} 40' N.$, and is navigable for steamers to the town of St. Mary, and much further for sloops. The surface of Florida is dotted with numerous lakes, some of which are navigable for large steamers. Lake Okeechobee, in the Everglades, is about 40 m. long and 30 m. wide.—The S. portion of peninsular Florida, from about lat. 28° , is mostly an extensive swamp or marsh, called the Everglades, which during the rainy season between June and October is impassable. N. of this tract to Georgia the surface is generally a dead level, but in some parts it is undulating, and occasionally hilly. W. of the neck of the peninsula the ground is more uneven and rugged; but still the elevations are inconsiderable and of very limited extent. The substratum of the E. part of the peninsula is clay mixed with sand, and that of the W. a kind of rotten limestone, which in many places is undermined by subterranean streams. The central district is the most productive, but even here a large portion is composed of poor pine barrens; yet in the midst of these are found gentle eminences (called hummocks) of fertile land, supporting a vigorous growth of oaks and hickories, while numerous rivulets of pure water flow through the country or expand into beautiful lakes. Further W. the land is more generally poor. The warmth and humidity of the climate compensate in a great measure for the inferior character of the soil, and give it a vegetation of great variety and luxuriance.—The productions of Florida are chiefly those which require a tropical sun. Sea island cotton (the production of which was formerly confined to a few small islands off the coasts of South Carolina and Georgia) will grow luxuriantly even in the centre of the peninsula, and a fine quality of this staple has been produced on the Suwanee. The soils are also adapted to the successful cultivation of the coffee plant, the cocoa palm, the sugar cane, cotton, tobacco, rice, indigo, arrowroot, Sisal hemp, New Zealand flax, &c.; and the climate is suitable for the cochineal insect and the silkworm. The principal forest trees are red, live, and water oaks, mahogany, palmetto, magnolia, dogwood, and in the swamps, pines, cedars, and cypresses. Oranges, lemons, limes, pineapples, olives, and grapes flourish luxuriantly; and garden vegetables are produced in the greatest abundance. The driest seasons are relieved by heavy dews, and the sun that would bake the earth in other parts, and wither vegetation, is so tempered by

the pervading moisture as to cover the surface with perennial verdure. The prairies afford excellent pasture. Cattle require little care from their owners, and no housing in winter; and in most parts of the state hogs fatten without any other support than that which they derive from the roots and mast of the forests. Deer of various kinds abound, and smaller game is found in all parts of the country. The coast waters produce the finest fish, including the sheepshead, grouper, redfish, and mullet, besides green turtle and oysters; and the numerous lakes and rivers of the interior teem with fresh-water species. On many parts of the coast sponge is found, and the trade in it is constantly increasing. Among the mineral productions are amethysts, turquoises, lapis lazuli, ochre, coal, and rich iron ore.—Among the most remarkable natural curiosities are the hollows called "sinks," worn in the soft limestone by subterranean streams, and varying in size from a few yards to several acres. The great sink of Alachua county, by which the waters of the Alachua savanna are supposed to flow into Orange lake, is a large basin almost surrounded by hills, into which the drainage of the savanna is conveyed by several conduits, uniting before they reach the basin in a single stream. From the basin the waters descend slowly by three great vent holes into the earth, and are carried by underground channels to other basins. Numerous springs, bursting from great depths, some of them with sufficient force to turn a mill, are found in different parts of the state, and have led to the supposition that the parts of the country in which they exist may be undermined by vast caverns through whose roofs the springs well up wherever an opening can be found. About 12 miles from Tallahassee is a lake of icy cold transparent water, which is fed by a subterranean source of this kind.—The climate of Florida is one of the finest in the world. The following meteorological summary from observations made at Jacksonville, lat. 30° 15', is reported by the chief signal officer of the United States:

YEAR.	Month.	Mean barometer.	Mean thermometer.	Total rainfall, inches.	Prevailing wind.
1871..	October.....	80.181	78.5	8.63	Northeast.
	November.....	80.091	65.4	8.63	Northeast.
	December.....	80.226	55.4	2.65	N'west.
1872..	January.....	80.174	52.7	8.44	N'west.
	February.....	29.998	53.9	2.70	S'west.
	March.....	80.103	59.1	7.32	Northeast.
	April.....	80.118	78.5	2.39	Northeast.
	May.....	80.089	78.8	1.25	S'west.
	June.....	80.073	81.0	6.97	S'west.
	July.....	80.069	88.4	2.92	Southeast.
	August.....	80.082	81.4	6.41	Northeast.
	September.....	80.065	77.7	10.66	Northeast.
	Annual mean.	80.101	69.6	58.96	Northeast.

In the south the temperature scarcely changes the year round, and summer is only distinguished by the copiousness of its showers. The average mean temperature of the state is

about 78° F., and the difference between summer and winter does not generally exceed 25°, while at Key West it is not more than 11°. The thermometer seldom rises above 90° in summer, and rarely falls below 80° in winter. Frost is unknown in southern Florida, and very little ice is formed in the northern part of the state. The atmosphere is generally dry and clear. Owing to the evenness and salubrity of its climate, Florida has long been a popular resort for invalids, and especially those afflicted with pulmonary complaints. Of the total deaths from all causes in Florida in 1870, as reported by the federal census, only 131 were from consumption. There were 173 deaths from all causes to one from consumption. The advantages of the climate in this respect are further shown by a comparison of the statistics relating to consumption as reported by the census of 1870, from which it appears that the ratio of deaths from consumption to those from all causes was less in Florida than in any other state except Nevada; and this advantage becomes still greater when it is considered that Florida being a popular resort for consumptives, a large proportion of those who die there from that cause came with the disease from other states.—According to the census of 1870, the state contained in farms 736,172 acres of improved land, 1,425,786 of woodland, and 211,588 of other unimproved land. The total number of farms was 10,241; cash value of farms, \$9,947,920; of farming implements and machinery, \$505,074; total amount of wages paid during the year, including value of board, \$1,587,060; total (estimated) value of all farm productions, including betterments and additions to stock, \$8,909,746; value of orchard products, \$53,639; of produce of market gardens, \$81,983; of forest products, \$7,965; of home manufactures, \$181,698; of animals slaughtered or sold for slaughter, \$520,966; of all live stock, \$5,212,157. There were on farms 11,902 horses, 8,835 mules and asses, 61,922 milch cows, 6,292 working oxen, 322,701 other cattle, 26,599 sheep, and 158,908 swine. The chief productions were 2,225,056 bushels of Indian corn, 114,304 of oats, 64,846 of peas and beans, 10,218 of Irish and 789,456 of sweet potatoes, 39,789 bales of cotton, 401,687 lbs. of rice, 157,405 of tobacco, 37,562 of wool, 100,984 of butter, 50,884 of honey, 6,052 of wax, 952 hogheads of sugar, and 344,339 gallons of molasses. The total number of manufacturing establishments in 1870 was 659, having 126 steam engines of 3,172 horse power and 79 water wheels of 528 horse power, and employing 2,749 hands, of whom 2,670 were males above the age of 16. The capital invested amounted to \$1,679,930; wages paid during the year, \$989,592; value of materials used, \$2,330,873; of products, \$4,685,408. The leading industries were 188 flouring and grist mills, which had \$119,075 capital invested, and from \$411,857 of materials yielded products valued at \$508,888; 104 establish-

ments for sawing lumber, with 69 steam engines of 2,487 horse power and 1,116 hands; capital, \$755,090; wages paid, \$421,820; value of materials \$1,163,238, of products \$2,235,730. There were 27 establishments for the manufacture of molasses and sugar, whose products were valued at \$41,510. The fisheries of Florida might be of great value, but as yet this industry has been but slightly developed. According to the census of 1870, the value of the fisheries for that year was \$101,528.—Florida has seven ports of entry: Appalachicola, Fernandina, Key West, Pensacola, St. Augustine, St. John's, and St. Mark's. The value of the imports from foreign countries for the year ending June 30, 1873, was \$505,571, and of the domestic exports \$2,984,975. Of the former \$389,054 were entered at Key West, and of the latter \$1,591,532 were from the port of Pensacola. The chief articles of export are lumber, cotton, tobacco, and fish. The number and tonnage of vessels entering from and clearing for foreign countries, and of those registered, enrolled, and licensed at the different ports, were as follows:

PORTS.	ENTERED.		CLEARED.		REGISTERED, &c.	
	No.	Tons.	No.	Tons.	No.	Tons.
Appalachicola ..	15	2,656	21	4,149	22	1,998
Fernandina ..	52	14,789	63	22,217	10	1,570
Key West	884	68,525	8-8	58,661	108	8,874
Pensacola	269	179,772	256	178,990	96	6,607
St. Augustine ..	..	..	..	..	8	82
St. John's	26	8,456	40	6,455	82	8,658
St. Mark's	4	990	2	123	5	509

The coasting trade is also very extensive, employing numerous steamers, which with other craft carry immense freights to Savannah, Charleston, Baltimore, Philadelphia, and New York. But a large portion of the material exported from Pensacola and Appalachicola originates in southern Alabama and southwestern Georgia. The great bulk of foreign merchandise consumed in the state is also entered coastwise, chiefly from the northern ports. The number of vessels that entered and cleared in the coastwise trade during the year ending June 30, 1873, was as follows:

PORTS.	ENTERED.		CLEARED.	
	No.	Tons.	No.	Tons.
Appalachicola	54	12,982	49	12,285
Fernandina	218	106,258	217	102,378
Key West	837	201,942	278	198,517
Pensacola	284	48,570	294	51,258
St. Augustine	60	9,518	48	8,678
St. John's	445	186,056	494	145,528
St. Mark's	148	68,845	158	70,046

Ship building is carried on at all of these ports. During the year 14 vessels of 241 tons were built.—In 1873 there were 466 m. of railroad in Florida. The Jackson, Pensacola, and Mobile railroad extends W. from Jacksonville across the N. part of the state, and is

intended to afford direct communication with Pensacola and Mobile. In 1873 it was in operation from Jacksonville to the Chattahoochee river, 209 m. The Florida branch extends from Live Oak N. to Lawton, Ga., on the Atlantic and Gulf railroad, and another branch extends S. from Tallahassee to St. Mark's. The Atlantic, Gulf, and West India Transit company's railroad connects Fernandina on the Atlantic and Cedar Keys on the gulf, 155 m. The St. John's River railroad extends from St. Augustine to Toccoi on St. John's river, 14 m., where connection is made with steamers to Jacksonville. The Pensacola and Louisville railroad extends from Pensacola to Pollard, Ala., on the Mobile and Montgomery railroad, 45 m.—The legislative authority is vested in a senate and assembly, designated the "legislature of the state of Florida." There are now 53 representatives and 24 senators. The sessions are annual, beginning on the first Tuesday after the first Monday of January, and may extend to 60 days. Members of the assembly are chosen for two years and senators for four years. The governor is elected for four years. He is required to be a qualified elector, and to have been a citizen of the United States nine years and of Florida three years next preceding the time of his election. A lieutenant governor is elected, whose term of office and eligibility are the same as those of the governor. The governor is assisted by a cabinet of administrative officers, consisting of a secretary of state, attorney general, comptroller, treasurer, surveyor general, superintendent of public instruction, adjutant general, and commissioner of immigration. These officers are appointed by the governor and confirmed by the senate, and hold office the same time as the governor, or until their successors shall be qualified. The governor is required to appoint in each county, with the consent of the senate, an assessor of taxes and collector of revenue, a county treasurer, county surveyor, superintendent of common schools, and five county commissioners, each of whom shall hold office for two years. Such officers are subject to removal by the governor, but only for wilful neglect of duty, a violation of the criminal laws of the state, or for incompetency. The governor and cabinet constitute a board of commissioners of state institutions, with supervision of all matters connected therewith. The judicial power is vested in a supreme court, circuit courts, county courts, and justices of the peace. All judges are appointed by the governor and confirmed by the senate; justices of the peace are also appointed by the governor. The supreme court judges hold office for life or during good behavior; those of the circuit courts for eight and of the county courts for four years. The supreme court consists of a chief justice and two associates, and holds three terms annually in Tallahassee. There are seven circuit courts, each having one judge. In addition to the usual functions, the county courts have full

surrogate or probate powers, but subject to appeal. Besides the above mentioned, the legislature may establish courts for municipal purposes only in incorporated towns and cities. A state attorney in each judicial district is appointed by the governor with the consent of the senate; also in each county a sheriff and clerk of the circuit court, who shall also be clerk of the county court and board of county commissioners, recorder, and *ex officio* auditor of the county, each of whom shall hold office for four years. The right of suffrage is conferred upon every male person of the age of 21 years and upward, provided he be a citizen of the United States or has declared his intention to become such, and has resided in Florida for one year, and in the county where his vote is offered for six months next preceding the election. The salary of the governor is \$5,000 a year; of the lieutenant governor, \$2,500; of cabinet officers, \$3,000; of justices of the supreme court, \$4,000, and of the circuit court, \$3,500. Florida is entitled to two senators and two representatives in congress. Provision is made for a state census to be taken in 1875 and every tenth year thereafter. The constitution provides that "institutions for the benefit of the insane, blind, and deaf, and such other institutions as the public good may require, shall be fostered and supported by the state;" but no such institutions have yet been established. The penitentiary at Chattahoochee contained in 1873 an average of 43 convicts; they are employed under contract outside the prison. The total cost of maintaining the prison in 1872 was \$20,078. The total assessed value of real estate in 1870 was \$20,197,691, and of personal estate \$12,283,152. The true value of real and personal estate was \$44,163,656. The total taxation not national was \$496,166, including \$248,768 state, \$168,389 county, and \$79,009 town, city, &c. The total receipts into the state treasury during the fiscal year were \$192,489, of which \$175,467 were from general taxes, \$14,096 from licenses, and \$2,926 from miscellaneous sources. The disbursements amounted to \$295,078, of which \$23,942 were for the executive department, \$78,337 for the legislature, \$82,697 for the judiciary, \$18,559 for schools and educational purposes, \$7,668 for interest, \$14,838 for printing, \$16,982 for the penitentiary, \$4,928 for the militia, and \$47,642 for contingent and miscellaneous expenses. The bonded debt, Jan. 1, 1873, was \$5,619,973, including bonds to the amount of \$4,000,000 issued to the Jacksonville, Mobile, and Pensacola railroad. In addition to this there was a floating debt of \$224,827. The constitution requires the legislature to provide a uniform system of common schools and a university for the free education of all children. The general supervision of the educational interest of the state is intrusted to a superintendent of public instruction, who with the secretary of state and attorney general constitutes the board of education for the

state. The common school fund is derived from the proceeds of all lands granted to the state by the United States for educational purposes; gifts by individuals, and the appropriations by the state; escheated and forfeited lands; money paid for exemption from military duty; all fines collected under the penal laws of the state; such portion of the per capita tax as may be prescribed by law for educational purposes; and 25 per cent. of the sales of public lands by the state. In addition to the other means provided, a special tax of not less than one mill on the dollar of all taxable property in the state is required to be levied. The common school fund must be distributed among the several counties in proportion to the number of children between the ages of 4 and 21 years. Each county is required to raise annually by tax a sum not less than one half the amount apportioned for the common school fund. Any school district neglecting to establish and maintain for at least three months in the year such schools as are required by law, forfeits its portion of the common school fund. The amount of the school fund in 1873 was \$281,785. The whole number of schools in the state was 444, and of pupils 16,258. About one fourth of the school population were enrolled in the public schools. The average duration of school was four and two thirds months. Florida is singularly deficient in institutions for advanced instruction. Lands have been granted by the general government, amounting in 1873 to 85,714 acres, for the support of two seminaries in East and West Florida. In 1872 the Florida state agricultural college was incorporated, which is designed to afford educational facilities to the working classes and prepare them for agricultural and mechanical pursuits. According to the census of 1870, the whole number of libraries was 258, with an aggregate of 112,928 volumes. Of these 178, with 87,554 volumes, were private. There were in the state 28 newspapers and periodicals, with a total circulation of 10,545; annually issued, 649,220 copies: 2 were tri-weekly, circulation 820; 1 semi-weekly, circulation 800; and 28 weekly, circulation 9,425. The total number of religious organizations was 420, having 390 edifices, with 78,920 sittings, and property valued at \$426,520, as follows:

DENOMINATION.	Organizations.	Edifices.	Sittings.	Property.
Baptist.....	127	128	21,100	\$38,460
Episcopal (Protestant).....	17	18	4,090	71,100
Methodist.....	285	215	42,000	140,700
Mormon.....	1	1	50	150
Presbyterian.....	29	29	6,620	70,810
Roman Catholic.....	10	9	8,950	90,500
Total.....	419	390	73,920	\$426,520

—The name of Florida (which signifies the florid or flowery, and was given by the Spaniards in allusion to the aspect of the country, and partly also because it was first visited by

them on *Pascua Florida*, or Easter Sunday) was originally not confined to the present state limits, but extended over an indefinite region northward, and to the Mississippi. The first visitant to the actual territory of Florida was Ponce de Leon, who landed near St. Augustine in 1513. It was subsequently visited in 1520 by Vasquez, a Spaniard; in 1523 by Verrazzano, a Florentine; and in 1524 by De Geray, a Spaniard. Two years later Pamfilo de Narvaez obtained a grant from Charles V. of all the lands from Cape Florida to Rio Panuco. In 1528 he landed with a numerous army at Appalachee, but met with a formidable resistance from the Indians, and at last perished on the coast near the Panuco by shipwreck, only 10 of his followers returning to Spain. In 1539 Fernando de Soto explored Florida. About the middle of the 16th century many Protestants of France sought refuge in Florida, but only to experience greater evils than they had endured at home. In 1565 they were attacked by the Spaniards, and many were hanged on the trees with an inscription purporting that they were destroyed "not as Frenchmen, but as heretics." This barbarity was soon afterward avenged by a party of Frenchmen, who attacked the Spanish fort, and hung up the garrison on the same trees that sustained the mouldering bones of their countrymen, inscribing over them that they were executed "not as Spaniards, but as outthroats and murderers." The Spaniards, persevering in their attempts to obtain a foothold in Florida, established a fort at St. Augustine in 1565, which they held till 1586, when it was captured by Sir Francis Drake. Two years earlier Captains Barlow and Amidas had taken nominal possession in right of England of the northern portion of the coast and the adjoining country. From this period for nearly a century, history is silent in relation to this country. In 1682 La Salle visited West Florida or Louisiana. In 1696 Pensacola was settled by Spaniards. In 1702 the Carolinians made an unsuccessful attack on St. Augustine, but in 1704 captured Fort St. Mark. The subsequent expedition of Oglethorpe against the Spanish settlements will be spoken of in the article *GEORGIA*. In 1763 the whole province of Florida was ceded to Great Britain in exchange for Cuba, which the English had then recently taken. Soon after the British divided the territory into two provinces, the river Appalachicola being the boundary between them, and by a proclamation invited settlers. Many Carolinians emigrated thither; and about 1,500 Greeks, Italians, and Minorcans were brought from the Mediterranean and settled at New Smyrna, about 60 m. S. of St. Augustine, where they began the cultivation of indigo and the sugar cane. Being badly treated by their employers, they removed to St. Augustine. During the revolutionary war privateers were fitted out at the ports of Florida, by which the trade of the southern provinces was severely harassed, and

the Indians were encouraged to a barbarous hostility against the Americans. In 1778 Gen. Prevost marched from Florida into Georgia, and captured Savannah and other towns. While engaged on this expedition he left his province open to incursions from Louisiana. In 1779 the Spaniards invested the garrison and settlement of Baton Rouge, and compelled them to surrender, and in May, 1781, Pensacola was captured. By the treaty of 1783 Florida was retroceded to Spain, and the greater part of the inhabitants deserted the country and settled in the United States. When Louisiana was ceded to the United States by France in 1803, it was declared to be ceded with the same extent that it had in the hands of Spain, and as it had been ceded by Spain to France. The terms of this cession gave rise to a claim on the part of the United States to the country west of the Perdido river; and to prevent the occupation of this territory by any other power, the government took possession in 1811 of the principal posts. The rest of Florida remained unmolested until the second war between the United States and Great Britain. In 1814, a British expedition having been fitted out from Pensacola, Gen. Jackson marched against that town and captured it. In 1818 it was again taken by Jackson, and also Fort St. Mark, but they were subsequently restored to Spain. Finally in 1819 Spain ceded the whole province to the United States, and possession was surrendered to the Americans in July, 1821. Immigration now set in to the territory, but the lack of surveys, the uncertainty of titles, &c., prevented its rapid settlement; and the Seminoles, a fierce and warlike Indian race, occupied the best lands. Yet in spite of these obstacles, a considerable population settled in the country. In 1835 a deadly war between the Indians and settlers broke out, and suspended what progress had hitherto been effected. A long contest ensued between the savages and the United States troops, which is known as the Seminole war, and resulted in 1842 in the subjection of the Indians, of whom the greater part were removed west of the Mississippi. The few remaining Indians continued to be troublesome, and on several occasions committed great depredations on the settlers; but on May 4, 1858, the whole body was removed, and on the 8th Gen. Loomis, then commanding in Florida, issued a proclamation declaring the war closed. Florida was admitted into the Union, March 3, 1845. An ordinance of secession from the Union was passed Jan. 10, 1861, by a convention which had assembled on the 3d. On the 7th Fort Marion, the arsenal at St. Augustine, and the Chattahoochee arsenal were seized by order of the state authorities; and on the 12th the navy yard and forts at Pensacola were taken. Fernandina, Jacksonville, St. Augustine, and other places on the E. coast were retaken by the national forces early in 1862, and held. Restrictions on commercial intercourse with

Florida were removed by proclamation of President Johnson dated April 29, 1865, and on July 13 William Marvin was appointed provisional governor. On Oct. 10 was held an election of delegates to a state convention, which assembled in Tallahassee on the 25th, and on the 28th repealed the ordinance of secession. Subsequently a legislature and state officers were elected, to whom the civil authority was transferred in January, 1866. Under the reconstruction measures of congress in 1867 Florida was made a part of the third military district, of which Maj. Gen. Pope was appointed commander. A convention to reorganize the state government was authorized by vote of the people in November. It assembled in Tallahassee Jan. 20, 1868, and subsequently framed a new constitution, which was ratified by the people in May. The legislature convened June 1, and adopted the 14th amendment to the federal constitution, in consequence of which Florida was recognized as a state by the general government. On July 4 the government was transferred to the state authorities. (See supplement.)

FLORIDA BLANCA, José Melino, count of, a Spanish statesman, born in Murcia about 1728, died in Seville, Nov. 20, 1808. His family was noble, but poor. He became an advocate, was appointed fiscal to the tribunal of the council of Castile, and made a report on the suppression of the Jesuits, which led to his appointment as ambassador to Rome. In 1777 he became premier to Charles III. In his administration of 15 years he built extensive roads, canals, bridges, and conduits; created more than 60 agricultural societies and numerous philanthropic institutions; founded the national bank of St. Charles, and the Spanish company of the Philippines; made treaties of commerce with the Porte, and concluded a treaty with Portugal which quieted the disputes about the South American colonies, and treaties with the emperor of Morocco and Hyder Ali; sought to avert the war against Spain by England in 1778, and made its burdens lighter on the people than those of any previous one of equal duration; made a treaty with Tripoli; punished the Algerine pirates; opened the trade with America to the world; reduced direct taxes and imposts; and introduced great and valuable reforms in the administration of justice. In 1792, after having been for three years the premier of the imbecile Charles IV., he was imprisoned in the castle of Pamplona, where but for his brother he would have perished from starvation. He was at length permitted to retire to Murcia. When the Spaniards rose against Napoleon in 1808 he was called to the presidency of the central junta of the kingdom, but soon sank under his onerous duties. Among his published works are: *Respuesta fiscal sobre la libre disposicion, patronato y proteccion inmediato de S. M. en los bienes ocupados á los*

Jesuitas (Madrid, 1788), and *Juicio imparcial sobre las letras en forma de breve publicadas por la curia romana, &c.* (1788-'9).

FLORIDA KEYS, a series of islands, extending in the form of a crescent 220 m. S. W. along the S. coast of Florida, beginning near Cape Florida, and ending in the Dry Tortugas, belonging partly to Dade and partly to Monroe county; pop. in 1870, 5,558. They lie between the mainland and the Florida reefs, and from 3 to 5 m. from the Gulf stream. They are very numerous, and vary in extent from a few acres to 25 sq. m. Cayo Largo (Long Key) is the largest of these islets (about 80 m. long and $\frac{1}{2}$ m. to 5 m. wide), and Key West the most important. They lie but a few feet above tide water, are of a uniform coral formation, very rocky, and mostly covered with a growth of hard wood.

FLORIN (It. *florino*), a gold coin first issued in Florence in the 11th century, of about the value of a ducat, bearing an impression on the obverse of a lily, and on the reverse of John the Baptist. It was soon imitated in other cities of Italy and in France and Spain, and in Germany gave origin to the mediæval *Goldgülden* and the later *Gulden*, which are still distinguished by the abbreviation (Fl.). Florin is now the appellation both of gold and silver coins in Europe, which vary in value in different countries. (See COINS.)

FLORIS, *Frans*, a Flemish painter, whose real name was De Vriendt, born in Antwerp about 1520, died there, Oct. 1, 1570. He first studied sculpture and then painting, and established a school which brought forward many eminent artists. He enjoyed great popularity owing to his rapid and prolific pencil, and to the boldness of his designs. He was one of the most successful painters and one of the greatest drunkards of his day. His masterpiece, "The Fall of the Rebel Angels," is in the Louvre. His other principal works are "The Last Judgment," in the church of Notre Dame at Brussels, and "The Assumption," in the Antwerp cathedral.

FLORUS, *Lucius Annæus*, a Roman historian, probably of Spanish birth, lived under the emperors Trajan and Hadrian. He is the author of an epitome of Roman history, in four books, extending from the foundation of the city to the time when Augustus closed the temple of Janus. The work is believed by some to have been compiled from the lost books of Livy and other historians. The style is declamatory, abounding in extravagant conceits and metaphors, and panegyrics of the Romans. The *Periclitium Veneris* and three other short poems are with little authority ascribed to this writer, and the *Epitoma* of the books of Livy have also been attributed to him.

FLOTOW, *Friedrich von*, a German composer, born in Teutendorf, Mecklenburg-Schwerin, April 27, 1812. A fondness for music led him in early youth to Paris, where he was instructed in composition by Reicha. In consequence

of the revolution of 1830 he returned to Germany, but soon after went again to Paris with the operas *Pierre et Colombine*, *Rob-Roy*, and *La duchesse de Guise*, composed in the mean while. He tried in vain to have these produced at one of the theatres of Paris, and it was only after their performance in private had excited the attention of amateurs that he received a commission in 1838 to furnish the music for *Le naufrage de la Méduse*. The opera was performed 54 nights at the Théâtre de la Renaissance, and it was afterward produced with equal success in London and other cities. He much increased his reputation by the *Forestier* (1840), *L'Esclave de Camoens* (1843), *Alessandro Stradella* (1844), and *L'Âme en peine* (1846). After remaining some years in Paris, in 1855 he took up his permanent residence at Schwerin, and became director of the court theatre. There he composed *Albin* (1856), *Martha* (1858), and *Zilda* (1866). Of all his operas *Martha* is the most popular, being sung in several languages.

FLOTSAM, an old word, used in connection with others equally barbarous, as jetsam and legan (or ligam), to designate different kinds of wrecked goods. Whether lawyers made them, or adopted them from seamen, is not certainly known; but the latter is supposed to be the case. Goods flotsam were goods which floated away when a ship was wrecked. Goods jetsam were those cast over from a ship in peril. Goods legan were goods which were cast out, but, because they would sink and be lost, were tied to wood or a cask or some other substance which would float. These words are now seldom if ever used; but the word jettison, formed probably from jetsam, is often used in insurance law and practice. It means properly the act of casting goods overboard; thus goods are said to be jettisoned, and a loss is said to be by jettison; and more rarely and inaccurately, the goods cast over are called the jettison; as, "the jettison consisted of such and such goods."

FLOUNDER, a flat fish of the family *pleuronectidae* or *planidae*, which also includes the halibut, sole, and turbot. This family, containing about 150 species, is found generally in comparatively shallow water, where the bottom is sandy; but the halibut and turbot are caught in deep water. The body is flat, compressed vertically, so that the dorsal and ventral surfaces are mere fin-bearing edges, the sides forming ovate disks variously colored, the darker being popularly called the back and the white side the belly, while in reality these surfaces are the sides. The most remarkable character of the family is the want of symmetry in the mouth and head, both eyes being turned to that side which is uppermost when the animal swims, and which is always the darker; the bones of the head, especially the presphenoid and the middle frontal, are distorted to allow this arrangement of the parts; behind the scapular arch there is no want of symmetry in the vertebral column. The dorsal fin fringes

the whole back, from near the tail to as far forward as the nostrils, the anal fringing the lower edge in a similar manner; the jaws and the ventrals are generally unsymmetrical, the latter being smaller on the pale side. The branchiostegal rays are six; the air bladder is absent, and the vent is very far forward.—The flounder belongs to the genus *platessa* (Cuv.); in this the eyes are generally on the right side, one above the other; the teeth are broad and cutting, and in a single series in the jaws, but generally pavement-like on the pharyngeals; the dorsal commences over the upper eye, and neither it nor the anal extends to the caudal; there are three pancreatic caeca. The common flounder of Massachusetts (*P. plana*, Mitch.) varies in length from 10 to 22 in., and in color (on the right side) from dull slate to rusty and blackish brown; the scales are small, and the surface smooth. This species is considered excellent for the table in summer and autumn, and is caught in considerable numbers from wharves

American Flounder (*Platessa plana*).

and bridges. Another species is the rusty dab (*P. ferruginea*, Storer), from 12 to 20 in. long, of a reddish slate color, with rusty spots, and the lower surface tinged with yellow. The New York flounder is the *P. dentata* (Mitch.), reddish brown, of about the same size, but considered inferior for the table. Among the species with eyes on the left side are the *P. oblonga* (Mitch.), growing to a length of 80 in., and the *P. stellata* (Pallas), an arctic flounder, of a liver-brown color, about a foot long. These species are said to be "reversed" when the eyes are on the left side in the first series, and on the right in the second; they are said to be "doubled" when both sides are colored; according to De Kay, the *P. melanogaster* (Mitch.) is a doubled variety of the *P. dentata*. Flounders extend, though in diminished numbers and of smaller size, into high northern latitudes; they are very abundant on the coasts of New Brunswick and Nova Scotia in summer. Like all the family, flounders are very tenacious of life, may be transported considerable distances, and may be naturalized in brackish and even in fresh water. The distortion of the flounder family admirably adapts

them for swimming on the bottom, where the situation of both eyes on the upper surface of the head allows an extensive range of vision; the coloration of one side, resembling the bottom on which they swim, serves as a protection against enemies. The food consists of minnows and other small fry, young fish, soft-bodied marine animals, and aquatic insects. There are 16 species in the British islands, which are gradually reduced to 13 in the Baltic, 10 on the coast of Norway, 5 at Iceland, and 3 in Greenland. The English plaice (*P. vulgaris*, Flem.), called also fluke in Scotland, is much esteemed; the spawning time is in February or March, and it is in the best condition for the table at the end of May. The English flounder is the *P. flesus* (Flem.), and may

English Flounder (*Platessa flesus*).

be distinguished from the plaice by the rough lateral line. The common dab (*P. limanda*, Flem.) derives the specific name from the roughness of its scaly surface, and, with other species, is considered excellent; they are taken by hook, spear, and net.

FLOURENS. I. Marie Jean Pierre, a French physiologist, born in Maureilhan, Hérault, April 15, 1794, died at Montgeron, near Paris, Dec. 6, 1867. He received the degree of doctor of medicine when only 19 years old, and went to Paris, where he became acquainted with Chaptal, the Cuviers, and Geoffroy Saint-Hilaire. In 1821 he delivered a course of public lectures on the physiological theory of sensation, and presented to the academy of sciences a series of papers on the organization of men and animals. He was already a contributor to the *Revue encyclopédique* and to the *Dictionnaire classique d'histoire naturelle*. In 1822 his essay on the *Détermination des propriétés du système nerveux* was highly praised by Cuvier for accuracy and originality. His reputation was further enhanced by his *Recherches sur les conditions fondamentales de l'audition et sur les diverses causes de surdité* (1824), and by his *Recherches expérimentales sur les propriétés et les fonctions du système nerveux dans les animaux vertébrés*, which he completed in 1825 by his *Expériences sur le système nerveux*. The last two papers present a very ingenious and thorough method of determining the relations of the individual organs to the

various phenomena of intellect, sensation, and motion. In 1828 he was admitted to the academy of sciences, and appointed assistant professor of natural history in the collège de France. Two years later he became assistant lecturer on comparative anatomy at the *jardin des plantes*; in 1832 titular professor at the museum; and in 1835 professor of natural history in the collège de France. From 1841 to 1854 he published a series of small works, giving in a condensed form and perspicuous style the history and philosophy of several branches of science. His *Cours sur la généalogie, l'ovologie et l'embryologie*, delivered at the museum of natural history and published in 1836 by Deschamps, and his *Cours de physiologie comparée: de l'ontologie, ou étude des êtres*, are equally remarkable for perspicuity and fulness. His *Anatomie générale de la peau et des membranes muqueuses* (4to, 1843) is intended to demonstrate anatomically the physical unity of mankind; and his *Théorie expérimentale de la formation des os* (1847) contains a demonstration of the principle that "matter changes and is renovated incessantly, while form and force persist." His most popular book is *De la longévité humaine et de la quantité de vie sur le globe* (1854). In 1853-'5 he published an annotated edition of the complete works of Buffon. Among his later works are: *Ontologie naturelle* (12mo, 1861); *Examen du livre de M. Darwin sur l'origine des espèces* (1864); and *De l'unité de composition et du débat entre Cuvier et Geoffroy Saint-Hilaire* (18mo, 1865). In 1837 he was a member of the chamber of deputies for Béziers; in 1846 Louis Philippe made him a peer of France; and in 1864 he was a member of the municipal council of Paris; but he never took an active part in politics. At the time of his death he was perpetual secretary of the academy of sciences. II. Gustave, a French agitator, son of the preceding, born in Paris, Aug. 4, 1838, killed at Chatou, near that city, April 3, 1871. He filled in 1863 his father's chair at the collège de France, and published *Sciences de l'homme* (1865) and other works. In 1866-'8 he participated in the Cretan insurrection in the field and as a member of the Cretan assembly, and became involved in difficulties with the French minister at Athens. On his return to Paris his denunciations of Napoleon III. caused him to be arrested in April, 1869; and on his release three months afterward he was severely wounded in a duel with Paul Granier de Cassagnac, who had attacked him in his journal. He warmly supported the election of Rochefort as a deputy in November, became one of the founders and the chief editor of the *Marseillaise* newspaper, and was the master spirit of the demonstration at the funeral of Victor Noir, who had been shot by Prince Pierre Bonaparte. When Rochefort was arrested early in 1870, Flourens attempted an armed resistance, and was sentenced to three years' imprisonment. He fled to England, returned to Paris

on the eve of the revolution of Sept. 4, and as a commander in the national guard took a conspicuous part in subsequent outbreaks. Early in 1871 he was again arrested and sentenced to death, but escaped. He reappeared in Paris after the insurrection of March 18, when he was elected member of the commune and the military commission, and commander of a regiment. At the disastrous termination of the march on Versailles, in which he commanded one of the three divisions, he was attacked by a body of gendarmes in a house in which he had taken refuge, and killed.

FLOY, James, an American clergyman, born in New York, Aug. 20, 1806, died there, Oct. 14, 1868. He was educated in Columbia college, and studied three years in Europe. He was received into the New York conference of the Methodist Episcopal church in 1835 and appointed to Riverhead, and was afterward for 18 years pastor of important churches in Middletown, New Haven, Brooklyn, and New York. By the general conference of 1848 he was placed on the committee to revise the Methodist hymn book. To his energy, culture, and taste are largely due the excellences of this collection. In 1854 he was appointed presiding elder of the New York district of the New York east conference. In 1856 he was elected by the general conference editor of the "National Magazine" and corresponding secretary of the tract society; but in 1861 he returned to the pastorate, in which he continued till his death. Dr. Floy was noted as being among the earliest and most able anti-slavery men of the Methodist church. Besides editing the posthumous works of the Rev. Dr. Stephen Olin, he contributed largely to periodical and Sunday school literature.

FLOYD, the name of counties in five of the United States. **I.** A S. W. county of Virginia, drained by Little river; area, 280 sq. m.; pop. in 1870, 9,824, of whom 997 were colored. The surface is mountainous, the county being in the Blue Ridge region. It is well adapted to pasturage. Copper and iron ore are found. The chief productions in 1870 were 29,410 bushels of wheat, 41,515 of rye, 112,789 of Indian corn, 98,692 of oats, 16,038 of potatoes, 8,646 tons of hay, 119,180 lbs. of butter, and 157,467 of tobacco. There were 1,846 horses, 3,769 milch cows, 4,159 other cattle, 7,956 sheep, and 7,820 swine. Capital, Jacksonville. **II.** A N. W. county of Georgia, bordering on Alabama, and traversed by Oosha river and its branches; area, 540 sq. m.; pop. in 1870, 17,280, of whom 5,753 were colored. The surface is diversified, and in some parts mountainous; the soil of the valleys and river bottoms is good. Iron, plumbago, galena, and other minerals are found. In the S. W. part is a mineral spring. The Selma, Rome, and Dalton railroad passes through the county. The chief productions in 1870 were 96,464 bushels of wheat, 24,091 of Indian corn, 43,229 of oats, 14,249 of sweet potatoes, and 8,182 bales of cotton. There were 1,085

horses, 1,143 mules and asses, 2,145 milch cows, 3,542 other cattle, 3,854 sheep, and 11,879 swine; 7 manufactories of carriages and wagons, 5 of bricks, 4 of iron and products of the same, 2 of sashes, doors, and blinds, 4 of tin, copper, and sheet-iron ware, 2 flour mills, and 6 saw mills. Capital, Rome. **III.** An E. county of Kentucky, intersected by the W. fork of the Big Sandy river; area, 500 sq. m.; pop. in 1870, 7,877, of whom 171 were colored. The surface is broken and affords good pasturage. Stone coal abounds. The chief productions in 1870 were 8,621 bushels of wheat, 388,009 of Indian corn, 26,325 of oats, and 7,795 of potatoes. There were 1,405 horses, 2,894 milch cows, 5,112 other cattle, 11,283 sheep, and 12,788 swine. Capital, Prestonburg. **IV.** A S. E. county of Indiana, bordering on the Ohio river, which separates it from Kentucky; area, 148 sq. m.; pop. in 1870, 23,300. The surface is diversified, and the soil fertile. Iron ore, limestone, sandstone, and slate abound. The Louisville, New Albany, and Chicago railroad passes through it. The chief productions in 1870 were 47,442 bushels of wheat, 124,807 of Indian corn, 66,110 of oats, 71,684 of potatoes, 4,509 tons of hay, and 98,243 lbs. of butter. There were 1,780 horses, 2,002 milch cows, 1,101 other cattle, 2,815 sheep, and 5,976 swine; 3 manufactories of boots and shoes, 7 of carriages and wagons, 1 of cars, 6 of clothing, 10 of barrels and casks, 2 of cutlery and edge tools, 3 of furniture, 2 of window glass, 7 of iron and its products, 5 of machinery, 3 of saddlery and harness, 2 of soap and candles, 5 of tin, copper, and sheet-iron ware, 1 of woollen goods, 4 planing mills, 4 breweries, 8 tanneries, 7 currying establishments, and 7 flour mills. Capital, New Albany. **V.** A N. E. county of Iowa, intersected by Red Cedar and Shell rivers; area, 550 sq. m.; pop. in 1870, 10,768. The Burlington, Cedar Rapids, and Minnesota, and the McGregor and Missouri River railroads pass through it. The chief productions in 1870 were 565,990 bushels of wheat, 310,119 of Indian corn, 29,359 of oats, 42,606 of potatoes, 18,517 tons of hay, 251,718 lbs. of butter, and 24,938 of wool. There were 4,023 horses, 3,472 milch cows, 5,883 other cattle, 6,244 sheep, and 6,950 swine; 4 flour mills, 3 saw mills, and 2 manufactories of agricultural implements. Capital, Charles City.

FLOYD, John Buchanan, an American statesman, born in Montgomery (now Pulaski) co., Va., in 1805, died at Abingdon, Va., Aug. 26, 1868. He was a son of Governor John Floyd. He graduated at South Carolina college in 1826, was admitted to the bar in 1828, and in 1836 removed to Helena, Ark., where he practised for three years. In 1839 he settled in Washington co., Va., and in 1847-'9 held a seat in the lower house of the state legislature. In December, 1849, the general assembly chose him governor of the state for the term ending Jan. 1, 1853. In 1855 he was again elected to the legislature. In 1856 he was chosen a pre-

sidential elector, and voted for James Buchanan, for whose nomination he had exerted himself at the democratic national convention, and in whose favor during the canvass he had made many speeches in different parts of the country. In March, 1857, he was appointed by President Buchanan secretary of war. When Major Anderson moved his garrison from Fort Moultrie to Fort Sumter, Dec. 26, 1860, and President Buchanan refused to withdraw the United States troops from Charleston harbor, Floyd resigned and retired from Washington. During the latter part of his administration of the war department he had dispersed the army to remote parts of the country, and transferred 118,000 muskets and many cannon from northern to southern arsenals. He was indicted by the grand jury of the District of Columbia as being privy to the abstraction of \$870,000 in bonds from the department of the interior, in the winter of 1860, but failed to appear for trial. Soon after the beginning of the civil war he was made a brigadier general in the confederate army, and commanded with Generals Wise and Henningsen in Western Virginia. On Sept. 10, 1861, he was defeated and driven from Gauley bridge by Gen. Cox, with the loss of baggage, ammunition, and camp equipage. He commanded a brigade at Fort Donelson when it was besieged by Gen. Grant, and the night before the surrender, Feb. 16, 1862, he, with Gen. Pillow and about 8,000 men of the garrison, escaped into Tennessee. For this retreat he was officially censured by the confederate government. He never again held a command.

FLOYD, WILLIAM, an American general, and one of the signers of the Declaration of Independence, born in Suffolk co., N. Y., Dec. 17, 1734, died in Western, Onondaga co., Aug. 4, 1821. He was the son of an opulent land owner, whose ancestors had emigrated from Wales and settled on Long Island. On the outbreak of the differences between Great Britain and her American colonies, Floyd ardently espoused the cause of the latter, and was appointed to the command of Suffolk county, and a delegate to the first continental congress in Philadelphia. During his absence the British assembled a naval force in Gardiner's bay, with the intention of invading Long Island and levying contributions; but Gen. Floyd returned, assembled the Suffolk militia, and displayed so much energy and daring that the enemy abandoned their enterprise. He was reelected a delegate to the general colonial congress, and continued a member by successive elections for eight years. In 1777 he was chosen a senator of the state of New York, retaining his seat in congress. He was a member of the first congress under the constitution, and declined a reelection. He was one of the presidential electors in 1801, giving his vote to Mr. Jefferson. In the same year he was chosen a member of the convention to revise the constitution of New York, and was afterward twice presidential elector.

FLÜGEL, Gustav Lebrecht, a German orientalist, born in Bautzen, Feb. 18, 1802. He studied philology, and especially the oriental languages, at Leipsic, Vienna, and Paris, and in 1832 obtained a professorship at Meissen, which he held till 1850, when he resigned it on account of his feeble health. His most important work is an edition of Hadji Khalfa's bibliographic and encyclopædic lexicon in Arabic, with a Latin translation and commentary, published at Leipsic and London, at the expense of the oriental translation fund (7 vols., 1835-'58). In 1834 he published an edition of the Koran, and in 1842 *Concordantia Corani Arabice*. His recent works are *Mani und seine Lehre* (1862), and *Die arabischen, türkischen und persischen Handschriften* (1865-'7).

FLÜGEL, Johann Gottfried, a German lexicographer, born at Barby, near Magdeburg, Nov. 22, 1788, died in Leipsic, June 24, 1855. He was employed as a merchant's clerk till 1810, when he went to the United States. He returned to Germany in 1819, and was professor of the English language at the university of Leipsic from 1824 to 1838, when he was appointed United States consul in Leipsic. He is the author of *Triglotte, oder kaufmännisches Wörterbuch in drei Sprachen* (German, English, and French, 2d ed., 1854), *Praktisches Handbuch der englischen Handelscorrespondenz* (6th ed., 1858), and other writings. His "Complete Dictionary of the English and German, and German and English Languages" has passed through several editions, and is extensively used in Germany, England, and the United States.

FLUORESCENCE, a peculiar appearance exhibited by certain bodies, either solid or in solution, which is due to a change of refrangibility in the rays of light. Sir David Brewster in 1838, having thrown a beam of sunlight concentrated by a lens through an alcoholic solution of chlorophyll in a transparent vessel, found that while the emergent beam was, as should be expected, of the color of the solution—a fine emerald green—the path of the beam through the liquid was marked to a certain depth by a bright blood-red light, emitted in all directions. Supposing this effect due to a reflection of part of the admitted light by minute solid particles suspended in the liquid, he termed the phenomenon one of internal dispersion. He discovered similar results in fluor spar and some other media; the new colors, however, not being always the same. In 1845 Sir John Herschel found that a weak solution of bisulphate of quinine, about 1 part of the salt to 200 of water, acidulated by addition of a little sulphuric acid, when viewed by transmitted solar light, appeared colorless; but that, at the same time, it emitted from a thin stratum at the surface at which the beam entered a beautiful sky-blue light, which in various other directions was seen as if emanating from the liquid. Beyond the thin stratum thus seen, the peculiar blue rays

no longer marked the course of the beam, nor did they appear in a second or third medium of the same kind into which the beam was successively passed; whence it was evident that at a certain depth the beam had lost the power of exciting them. Herschel therefore proposed for the phenomenon the name of epipollic (surface) dispersion. The character of the change was not understood until in 1852 Prof. Stokes submitted the subject to a more careful investigation. He reasoned that the facts observed by Brewster and Herschel were the same, the rays which produced the red dispersed light possessing the power of penetrating to a greater depth before being exhausted than did those producing the blue. The latter he found to be exhausted within a film about $\frac{1}{16}$ of an inch thick, but the blue light to which they gave rise traversed the liquid with perfect freedom; hence there must be a difference of nature between the producing and the produced rays. Such differences could, probably, only be explained by polarization or change of refrangibility; but the supposition of polarization was found untenable, and the case was not one of phosphorescence. In order to test the remaining hypothesis, Stokes obtained a pure luminous spectrum by means of an achromatic lens and two or more flint-glass prisms, and in place of receiving the colors on a screen held the quinine solution in these successively. In the less refrangible colors no effect was observed; but about the middle of the violet space the blue diffused light made its appearance at the entering surface, as if the liquid medium had there become self-luminous. This result appeared in all parts of the upper violet, and until the tube had been carried to some distance into the ordinarily dark space beyond, occupied by the chemical rays. The depth of the stratum thus luminous at first exceeded the thickness of the vessel used, but it rapidly diminished in the upper parts of the space to a minute fraction of an inch. The blue light, turned aside and again dispersed by a prism held obliquely in its course, yielded in some degree rays having various refrangibilities, with color corresponding, the higher colors being most abundant. By other experiments, also, the blue dispersed light was separated from the inducing violet rays; and it was found that the former always corresponded to a band of colors below the place of the latter. The light thus acted on, then, had its refrangibility always lowered. Thus the remarkable conclusion was arrived at, that by passing light through particular media certain rays belonging to the violet space have their refrangibility, and of course their color, let down in the scale, while portions of the invisible chemical rays in like manner become let down so as to fall within the range of visibility, and to appear as colored light. In the undulatory theory, these results are explicable only by an increase of the wave length and time of vi-

bration, with a consequent diminution of the velocity of the rays thus affected. The case is one of degradation of light: in the chlorophyll solution there is a fall from higher colors to red; in the quinine solution, from invisible or violet to a mixture whose predominant hue is blue; in canary glass, colored yellow by oxide or salts of uranium, from invisible or violet to green. The striking feature in these results is the conversion of the unseen ray power, which ordinarily induces chemism only, as in the decomposition of carbonic acid and fixation of carbon within the green leaves of plants, and in the blackening of the photographic plate, into common light, thus proving the intimate relation, if not the identity, of the two. Stokes gave to the phenomenon the name of fluorescence, as having been seen in fluor spar; and this name, conveying no theory of the case, is preferred. It is conveniently observed by pencilling over, by candle light, a sheet of white paper with the quinine solution, or by tracing with it letters on the paper: nothing unusual is observed on the paper, which is as white as before, until it is brought into some light well supplied with chemical rays, and not too brightly luminous for witnessing the effect (as into a beam in an otherwise dark room), when fluorescence appears; and when in such a room the beam is decomposed, the luminous spectrum hidden from the view, and the paper brought into the ultra-violet space (which is of itself, of course, dark), its sudden lighting up with a pale blue radiance is an effect apparently little short of the supernatural. Other fluorescent media are infusion of horse-chestnut bark, or its active principle, aesculine, the infusion of seeds of *datura stramonium*, tincture of turmeric, &c. Gas and candle light excite little or no visible fluorescence; hence these are poor in actinic rays. The flames of hydrogen and of sulphur burning in alcohol give very distinct results; hence these abound in those rays. But so rich in this respect is the light of the voltaic arc from metallic points, that it produces fluorescence through a space six or eight times the length of the luminous spectrum. It is worthy of remark, however, that the fluorescent space can be detected to any considerable distance above the violet only when the prisms employed are of quartz. Glass at once cuts down the effect within narrow limits, proving that it is highly opaque to the chemical rays, for which quartz serves as the true glass. In 1858 Mr. Robinson of Armagh found the light of the aurora borealis to produce, for its intensity, very marked fluorescence; another fact favoring the electric origin of that phenomenon.—M. Niepece the younger claimed in 1859 that he had preserved during six months the photogenic power of light, in card paper impregnated with tartaric acid or nitrate of uranium, exposed for half an hour to sunlight, and then at once sealed up in a tin tube. It is certain that at the end of this time this card, removed

in the dark, placed over sensitized or photographic paper, with a partially translucent drawing or printed sheet interposed, and left so for many hours, gives a very good negative picture on the sensitized paper, the latter being darkened through the lights and protected by the shades of the interposed figure. But it is still a question whether this effect is due to preserved light, or rather actinism, or to the effect of hydrogen gas set free from compounds in the prepared card, and acting chemically on the photographic paper. Invisible drawings in fluorescent substances, exposed to the sun and immediately or soon after applied in the dark, acted more powerfully; but interposed fluorescent bodies, as well as glass, arrested the action.—At a session of the American academy of sciences held at the Stevens institute, Hoboken, Oct. 30, 1873, President Morton of that institution related some investigations recently made upon a new body which he has discovered by means of spectrum analysis, associated with anthracene. This new body, which he has succeeded in isolating and subjecting to the action of the solar spectrum, possesses remarkable fluorescent properties. It is isomeric with anthracene, but differs from it in its chemical reactions, particularly with chlorine, bromine, and sulphuric and picric acids, requiring twice as many equivalents of the latter bodies to form a compound as anthracene does. Its action upon actinic light is unlike that of all other fluorescent bodies yet experimented upon. Its continuous spectrum is banded, and if a strong solution is placed in a bright sunlight and kept hot to maintain the solution, it undergoes a definite change and has all its bands moved upward to higher positions in the spectrum. In its first or normal condition its fluorescence produces a green light, but in its second condition it is blue. To the substance in the first condition President Morton has given the name thallene, and to the modified form the name petrolucene in reference to its origin and its brightness.

FLUORINE, a gaseous body, regarded as an elementary substance, the chemical equivalent of which, calculated from the combination of calcium and fluorine in fluor spar, is 19. It is found in the teeth and bones of animals, in sea and some mineral waters, and in many phosphates and other minerals. On account of the great difficulty of preventing fluorine, when driven from its combination with one substance, from immediately combining with any other with which it comes in contact, it has been impossible to investigate its qualities in its isolated state, and hence the slight uncertainty as to its elementary nature. Louyet obtained it by decomposing dry fluoride of silver by means of chlorine gas in vessels of fluor spar. He found the dry gas possessed affinities analogous to those of oxygen and sulphur; it acted upon almost all metals, but attacked glass feebly or not at all. Prat prepared it from fluoride of lead, and says that it decomposes

water with intensity. Combined with hydrogen in the form of hydrofluoric acid, however, its most remarkable property is its rapidly corroding glass; and for this reason it is employed for etching. Its presence is detected in any body that contains it, by submitting this in a vessel of platinum or lead, which are but slightly affected by the acid, to the action of concentrated sulphuric acid, and placing a plate of glass across the mouth of the vessel to receive the vapors evolved on the application of a gentle heat. This is the process by which hydrofluoric or fluohydric acid is obtained from fluor spar, the metallic vessel being a retort, furnished with a crooked neck of lead, in which the vapor condenses in the water placed in the bend to receive it, and which is kept cool by being surrounded with ice. It may also be obtained by condensing the vapors without the use of water in the lead tube; in this state it is called anhydrous fluohydric acid. The hydrated acid is a colorless fluid, of specific gravity 1.06, boils at 86°, and cannot be made to congeal at any temperature. It has a strong affinity for water, its vapor rising and forming thick white fumes as it combines with the moisture in the air, until by dilution this action at last ceases. Dropped into water, a sound is produced with the fall of each drop, as if it had been red-hot iron. When diluted with water it is highly corrosive, and according to its strength may produce injury by touching the skin. A single drop of the anhydrous acid may produce acute inflammation accompanied with fever. The marks made by the gaseous acid when used for etching are fine and visible on account of their opacity, while those produced by the liquid are transparent, and must be deeply etched. The product of this action of the hydrofluoric acid upon silicious substances is the gaseous compound known as fluosilicic acid or fluoride of silicon; and thus is a means afforded of volatilizing silica and removing it from some of its combinations, by which their analysis is facilitated.

FLUOR SPAR, fluoride of calcium, a mineral species consisting of fluorine 48.7 and calcium 51.3 per cent., named from the Latin *fluere*, in reference to its property of flowing when used as a flux. It is met with in cubical crystals, which easily cleave into octahedrons and tetrahedrons by removal of the solid angles. These crystals, collected in groups, their faces presenting a fine splendid lustre, and some brilliant shade of red, blue, green, or purple, constitute some of the most beautiful mineralogical specimens. They are sometimes transparent, but commonly translucent, and are brittle, breaking into splintery and conchoidal fragments. The hardness of the mineral is 4; its specific gravity 3.14 to 3.19. Coarsely pulverized and heated, it emits phosphorescent light of various colors. Before the blowpipe it decrepitates and fuses to an enamel. It is met with in veins in the metamorphic rocks, and in the limestones of formations as recent as the

coal. In the north of England it is a common gangue of the lead veins which are found in the strata of the coal formation; and it is there most conveniently applied as a flux for the reduction of these ores, for which it is peculiarly adapted. The most famous locality of fluor spar is at Castleton, in Derbyshire, England, whence the name of Derbyshire spar has been given to the mineral. It is there found in the fissures of the limestone of deep blue and purple colors, in specimens so large and beautiful that they are wrought into vases, inkstands, cups, tables, &c., which present fine colors and polish, but which from their softness are liable to be soon defaced. The blue color is often so intense that the articles cannot be worked thin enough to exhibit the shade; but by heating the stone nearly red-hot, the intensity is diminished and the blue changes to amethystine. If the heat is continued, the color disappears. The workmen call the stone blue John. They chip the block into a rude shape, and then heat it, so that on applying rosin over its surface this will fuse and penetrate slightly into the mass, the object of which is to check the tendency to cleave as the stone is afterward worked in the lathe; and as the particles are removed in this operation, the rosin is occasionally repeated. The manufacture is difficult, from the crystalline structure with its fourfold cleavage causing the laminae to split up in unexpected places. The best workmen often fail in turning very thin hollow articles. Fluor spar is found at many localities in the United States, and is now largely used for practical purposes. Fine crystals, commonly green and very large, are found in different places in Jefferson and St. Lawrence counties, N. Y., and at Rossie they have been used as a flux in smelting lead ores. In Illinois, below Shawneetown on the Ohio, it is found in large purple crystals, with the same associations of lead ores and coal that accompany it in the north of England. The lead veins of the metamorphic rocks of New England often contain it as one of the gangues. From fluor spar is obtained fluorine, which, combined with hydrogen in the form of hydrofluoric acid, is used to etch glass. A variety of fluor spar has been discovered in Germany, which on the application of heat gives off an odor which Schönbein attributed to a modified oxygen, called antozone; the mineral is called antozonite.

FLUSHING, a village and town of Queens co., New York, about 8 m. N. E. of Brooklyn; pop. of the village in 1870, 6,223; of the town, 14,650. The village is at the head of a bay of the same name opening into Long Island sound, and has daily communication with New York by the Flushing and the Flushing and North Side railroads and connecting ferries. It is noted for its magnificent avenues, lined with elegant residences, many of which are owned by New York merchants, and for its extensive gardens and nurseries, which are resorted to by numerous visitors. It is the seat of the

Flushing institute, an academy which in 1872 had 7 instructors and 104 pupils; the Flushing female seminary; St. Joseph's academy for young ladies, with 100 pupils; St. Mary's seminary for boys; and St. Joseph's convent, containing 118 sisters. One daily and two weekly newspapers are published. There are eight churches, Baptist, Congregational, Dutch Reformed, Episcopal, Methodist (three), and Roman Catholic. Two of the Methodist churches are for colored people.—The town also contains the villages of College Point (pop. 3,852) and Whitestone (pop. 1,907).

FLUSHING (Dutch, *Vlissingen*), a fortified town and seaport of Holland, in the island of Walcheren, province of Zeeland, on the N. shore of the estuary of the W. Scheldt, 50 m. S. W. of Rotterdam; pop. in 1867, 11,521. It is well built, and contains several churches, schools, and charitable institutions, an academy of sciences founded in 1765, a school of navigation, five market places, extensive dockyards, a town hall, a theatre, and an exchange, near which is a statue of Admiral de Ruyter, who was born here. The principal manufactures are beer, soap, and oil; but the inhabitants are chiefly engaged in commerce, and branches of industry subsidiary thereto. The port of Flushing is formed by two moles which break the force of the sea. The town is connected with the sea by two large and deep canals, navigable for first-class merchant ships, which enter the town and unload at the quays close to the warehouses. The number of vessels entering and clearing is about 100 annually. Like Briel it was called a "cautionary town," having been given to Queen Elizabeth as security for the subsidy and soldiers sent to assist the Dutch, under Sir Philip Sidney. The French took possession of the town in 1795, and made it a principal station for their fleets. In 1809 it was bombarded and taken by the British under Lord Chatham, but was soon after evacuated. The new docks, completed in 1878, have made Flushing a rival of Antwerp in maritime and commercial activity. It is the only continental port east of the English channel which will admit the largest ships at all seasons.

FLUTE, a wind instrument, which under different forms and names has been in use for more than 4,000 years. It was familiar to the Egyptians from a remote period, and among the Greeks and Romans was a favorite pastoral instrument, employed also on sacred and festive occasions, in military bands, and at funerals. Its present name is derived from the Latin *fluta*, an eel caught in the Sicilian waters, whose side is marked with seven spots like flute holes. The Egyptian flute was from 2 to 3 ft. long, and the performer generally sat on the ground; while that of the Greeks probably did not exceed a foot in length. At Athens it was once in great repute, but was superseded by the lyre, the use of which did not distort the face, while it allowed the accompaniment of the voice. In Thebes, Sparta, and other

places, however, it continued a favorite. The Spartan flutists were a hereditary order, and the Spartan soldiers marched to battle to the sound "of Dorian flutes and soft recorders." The Egyptians appear, from their ancient pictures and sculptures, to have blown the instrument through a lateral opening near one end, producing the modulations by means of holes on the sides; hence it differed little from the modern fife. The flute of the Greeks and Romans was probably more in the nature of the pipe, and was often composed of two perforated tubes of reed or wood, played together. Until the early part of the 18th century the instrument retained the form of the pipe, and was called the English or common flute, and sometimes the *flûte à bec*, from the resemblance of the mouthpiece to the beak of a bird. It was played in the manner of the clarinet, and had seven finger holes, but no keys. This gave place somewhat more than a century ago to the German flute, which in its most perfect form consists of a tube of hard wood or ivory about 27 in. long, separable into four joints, and having from six to twelve finger keys for semitones. It is blown through a lateral hole at one end, and has a compass of nearly three octaves, from C below the treble staff to C in altissimo. The modern flute is highly effective in an orchestra, but has fallen into some disrepute for the performance of solos, in consequence of the flimsy and tasteless character of the music too frequently written for it, and which serves to exhibit the skill of the player rather than the capacity of the instrument.—The octave flute, called also the *piccolo*, is a small shrill instrument, an octave higher than the common flute. Its piercing sounds are only effective in a large orchestra or in military bands.—The flute stop, on the organ, is a range of pipes tuned in unison with the diapason, and intended to imitate the sounds of the flute.—One of the best German flutists of the 18th century was Quanz, the flutist of Frederick II. of Prussia; François Devienne (died in 1802) and Berbiguier (born in 1781) acquired a high reputation in France; and among the great flutists of the present century in Germany were Fürstenau and his son (died respectively in 1819 and 1852), and in England Charles Nicholson, whose father had also been celebrated in the preceding century. Among celebrated flutists are the following: Theobald Böhm, flutist of the king of Bavaria, born about 1802, who invented about 1838 a new flute known as the Böhm flute, which is said to combine improvements in nearly every part of the instrument, and wrote in 1847 a treatise on recent improvements in the manufacture of flutes, which was translated into French (Paris, 1848); Jean Louis Tulou, born in Paris, 1786, and for some years professor of the conservatory there; and Louis Drouet, born in Amsterdam in 1792, who was for some time Tulou's rival in Paris, and removed in 1881 to Belgium and engaged in manufacturing musical instruments.

FLUVANNA, a central county of Virginia, bounded S. by the James river and intersected by Rivanna river; area, 170 sq. m.; pop. in 1870, 9,875, of whom 5,097 were colored. The surface is partly level and partly broken. In parts the soil is fertile and in other places barren. The James River canal extends along the S. border. The chief productions in 1870 were 77,486 bushels of wheat, 126,448 of Indian corn, 67,247 of oats, and 894,028 lbs. of tobacco. There were 1,138 horses, 1,648 milch cows, 2,122 other cattle, 7,248 swine; marble works, and a flour mill. Capital, Palmyra.

FLUX (Lat. *fluere*, to flow), a substance used to facilitate the fusion of minerals, and frequently their decomposition. A great variety of materials serve this purpose, and one or another is used according to the nature of the body to be treated, and the chemical action desired. Some by their ready fusibility induce the same condition in bodies in contact with them which are difficult to melt; others, though they may be as infusible as the compounds they are brought in contact with, present ingredients which possess affinities for some of those in the body to be acted upon, and fusion then takes place, with mutual decomposition and recombination of elements. Thus in treating the common silicious ores of iron, which are extremely difficult to melt, limestone, still more infusible, is employed, and the lime uniting with the silica enters at once into fusion, while the oxide of iron, freed from its original combination, is at the same time decomposed by the carbon of the fuel combining with its oxygen, and the iron flows free. The carbon itself may be regarded also as a flux, its action being to facilitate this process in the same manner as the limestone does. Should the iron ores be calcareous, the mineral flux to aid their decomposition must be silicious, that the same fusible silicates may be produced. Borax is a flux of very general application, from the readiness with which it forms fusible compounds with silica and other bases. The subject will be considered, as to the application of particular fluxes, in describing the metallurgic treatment of the ores of the various metals. (See also BLACK FLUX, and BORAX.)

FLUXIONS. See CALCULUS.

FLY, the popular name of the *diptera*, or two-winged insects, of which a familiar example is the common house fly. They have a sucking proboscis, two veined and membranous wings, and two poisers behind the wings; they undergo a complete transformation. The characters of the order have been sufficiently detailed in the article *DIPTERA*, and therefore only some of the most common flies of the family *muscidae* will be noticed here. The house fly (*musca domestica*, Linn.) of Europe is considered distinct from the American species by Dr. Harris, who calls the latter *M. harpyia*; it begins to appear in houses in July, sometimes a little earlier, becomes very abundant toward the end of August, and does not disappear until

killed by cold weather; the eggs are deposited in dung, in which the fleshy larvæ undergo their transformations; consequently this species is most numerous in the vicinity of stables and unclean places. The swarms of summer are doubtless the progeny of a few individuals

House Fly (*Musca domestica*), magnified.

which have survived the winter in some protected nook, and are not produced from eggs laid the preceding season; it is possible that a few may pass the winter in the pupa state, and be developed by the warmth of spring. Among the thousands of domestic flies, all are of the same size, those larger or smaller being of different species, and neither very old nor very young individuals of the *M. domestica*. The house fly is such a constant companion of man, that its presence in a coral or other island is sufficient evidence that human inhabitants are not or have not been far distant. Its two compound eyes contain 4,000 facets, each the cornea of a separate *ocellus*; the spiracles through which air enters the tracheæ are provided with a kind of sieve formed by minute interlaced fibres, which prevent the introduction of dust and foreign substances. The hard parts of the proboscis are undeveloped, in their place being a fleshy tongue-like organ, or *labium*, bent underneath the head when at rest. Its knob-like end may be extended into two flat, broad, fan-shaped muscular leaves, by whose sucker-like surface the fly laps up liquid sweets, as sugar dissolved by its own saliva. The leaves are supported on a framework of tracheæ, which end in projecting hairs, acting as a rasp on delicate surfaces, and causing a tingling on the naked skin of man. It is well known that flies, like many other insects, have the power of creeping up smooth perpendicular surfaces, and of walking on ceilings with their backs downward. The last joint of the tarsus has two strong hooks, and a pair of membranous expansions (*pulvilli*), beset with numerous hairs, each having a minute disk at the extremity. There has been considerable difference of opinion as to the precise mode in which this apparatus enables the fly to walk in opposition to the force of gravity. Derham, Home, Kirby, and Spence believed that the *pulvilli* act as suckers, a vacuum being formed beneath, and that the insect is held up by the pressure of the atmosphere against their upper

surface; others have maintained that the adhesion is due to a viscid liquid secreted from the bottom of the foot. Dr. Hooke and Mr. Blackwall assert that the soles of the feet are so closely beset with minute bristles that they cannot be brought in contact with any surface so as to produce a vacuum, and believe that the support is owing to the strictly mechanical action of these hooks. Mr. Hepworth ("Journal of Microscopical Science," vols. ii. and iii.) reconciles these apparently contradictory opinions by the conclusion that the minute disks at the end of the individual hairs act as suckers, each of them secreting a non-viscid liquid, which renders the adhesion perfect; a structure which exists on a larger scale in the feet of *dytiscus* and other beetles. Mr. White, in his "Natural History of Selborne," observes, in confirmation of the views of Derham, that toward the close of the year, when flies crowd the windows in a sluggish and torpid condition, they are hardly able to lift their legs, and many are actually glued to the glass, and there die from inability to overcome the pressure of the atmosphere. It is well known that some lizards possess a similar faculty, and a similar apparatus to account for it. A dish of strong green tea, well sweetened, will be eagerly tasted by flies, and prove a certain poison; according to Mr. Spence, a netting of large meshes stretched across a window of a room lighted only on one side will not be passed by flies.—The blue-bottle or blow fly (*M. [calliphora] vomitoria*, Linn.) is a large, buzzing species, blue-black, with a broad,

steel-blue, hairy hind body; it is found in summer about slaughter houses and all places where meats are kept, which it frequents for the purpose of depositing its eggs on animal substances. The eggs, usually called fly blows, are hatched in two or three hours; the larvæ increase so rapidly in three or four days, and are so voracious, that Linnaeus did not greatly exaggerate when he said that the larvæ of three females of this species will devour the carcass of a horse as quickly as would a lion; they pass the pupa state in the ground or in some crevice, the larval skin not being cast off, but changed into an egg-shaped case; from this they emerge as flies in a few days, or, if hatched late in the season, remain unchanged through the winter. A smaller, brilliant, blue-green fly, with black legs, much resembling the *M. (lucilia) Cæsar* of Europe, lays its eggs on meat and the carcasses of animals.—The flesh fly (*sarcophaga carnaria*, Meig.), somewhat



Blue-Bottle (*Musca vomitoria*).
Larva and Pupa.

fly (*sarcophaga carnaria*, Meig.), somewhat

larger than the blow fly, is ovo-viviparous; it drops the living larvæ on dead and decaying animal matter, and these active little scavengers commence at once their work of purification. A single female will produce about 20,000 young, which have been ascertained by Redi to increase in weight nearly 200-fold in 24 hours; Réaumur found the assemblage of embryo flies in this insect to be coiled like a watch spring, about $2\frac{1}{2}$ in. long when unrolled; the larvæ arrive at maturity in succession, and the mother as usual dies soon after the brood is hatched. This European species is black, with lighter stripes on the shoulders, and grayish black abdomen checkered with lighter squares. Another species of Europe is the *S. mortuorum* (Linn.), five or six lines long, with a golden head, grayish black thorax, steel-blue abdomen, and white wing scales. Both of these sometimes deposit their young on wounds and ill-conditioned ulcers of the living human body. The largest American species is the *S. Georgina* (Wiedemann), the females of which are about half an inch long; the face is silvery white, with a black spot between the copper-colored eyes; the thorax light gray, with seven black stripes; the hind body, conical and satiny, is checkered with black and white; they appear about the end of June, and continue till after the middle of August. In this genus the bristles on the antennæ are plumose.—The dung fly (*scatophaga stercoraria*, Meig.), of a yellowish olive color, deposits its eggs in soft dung; at the upper end they have two divergent processes which prevent their sinking too far into the nidus. The *S. furcata* (Harris) of the United States has the same habits, and has been erroneously charged with producing the potato rot, simply because the larvæ are found upon the stalks of this plant, developed from eggs laid in the surrounding manure. The males are yellow, with hairy body and legs, and long narrow wings, and are about half as large as a honey bee; the females are smaller, less hairy, and olive-colored; both young and adult insects live upon dung, and do not injure plants.—The stable fly (*stomoxys calcitrans*, Meig.) is a well known tormentor of animals and man, whose skin it perforates by a painful bite in sultry weather and just before rains; it resembles very closely the house fly, except that the antennæ are feathered, the proboscis very long and slender, and the size smaller; it attacks the legs, piercing through thick stockings and the thickest hair, returning to the attack as soon as driven away; it is solitary, not social like the house fly, and seldom enters houses unless driven in by bad weather; it is most abundant in August and September, when it is a great pest to horses and cattle; it is about one third of an inch long, and lays its eggs in dung, in which the young are hatched and undergo their transformations.—The cheese fly (*piophilæ casei*, Fallen.) is only $\frac{1}{2}$ of an inch long, shining black, with transparent wings and yellowish hind

legs. By its long ovipositor it penetrates the cracks of cheese, and deposits about 250 eggs, which are developed in a few days into maggots or skippers; these larvæ have two horny

Cheese Fly (*Piophilæ casei*).

hooked mandibles, which they use for digging into the cheese, and for locomotion instead of feet. This larva leaps 20 or 30 times its own



Larva of *Piophilæ casei*.

length, first erecting itself on the tail, then bending into a circle and seizing the skin near the tail with its hooked jaws, and finally projecting itself forward by suddenly throwing itself into a straight line. The droppings and decay caused by these larvæ give a flavor to old cheese which is much relished by epicures. The wine fly, living in old casks and bottles, is also a *piophilæ*.—There are several species of flower flies, of the genus *anthomyia*, of small size and feeble flight, which sport in the air in swarms like gnats, and which in the larva state are very injurious to vegetation; some of these maggots are like those of common flies, others are fringed on the sides with hair. The *A. ceparum* (Meig.), of an ash-gray color, with

Onion Fly (*Anthomyia ceparum*).

1. Fly. 2. Larva. 3. Pupa.

black dorsal stripes, and about half the size of the house fly, lays its eggs on the leaves of the onion close to the earth; its smooth white larvæ bore into the bulb, and entirely destroy it. The *A. brassicæ* and *A. lactucarum* are equally destructive to the cabbage and lettuce; the *A.*

raphani (Harris) attacks in the same way the radish. The *A. scularis* and *cunicularis* give rise to fringed maggots, which have been not unfrequently ejected from the human body, having probably been swallowed with vegetables in which decay had commenced; as the eggs in many instances belong to species depositing in the ordure of privies, the larvæ might remain alive for a considerable period in the intestines of man; eggs of other *muscida* might be introduced on meats, fruits, salads, vegetables, and in impure water. In the "Transactions" of the entomological society of London (vol. ii., 1837), Mr. Hope gives a tabular account of 87 cases in which maggots of the *muscida* infested the human body, many of which were recognized as belonging to *M. domestica*, *C. vomitoria*, and *S. carnaria*; and many cases have since been recorded in medical journals.

FLYCATCHER, the popular name of many denti-rostral or tooth-billed birds, of the order *passeres* and subfamily *musci-capinae*. They have bills of various lengths, generally broad and flattened at the base, with the culmen curved and the sides compressed to the emarginated tip; the gape is furnished with long and strong bristles, for the easier securing of their flying prey; the wings are usually long, as also is the tail; the tarsi short and weak; the toes long, the outer generally united at the base. The subfamily *musci-capinae* includes the following genera: *conophaga* (Vieill.), with 7 species, found in the thick woods of tropical America; *platyrhynchus* (Desm.), with about 20 species, in the brushwood and trees of tropical America; *platysteira* (Jard. and Selby), African, with a dozen species; *todirostrum* (Less.), with 15 species, South American; *musci-vora* (Cuv.), 3 species, South American; *rhinopidura* (Vig. and Horsf.), 40 species, found in India and its archipelago, New Zealand, and Australia; *tehitrea* (Less.), 20 species, in Africa, India, and its archipelago; *monarcha* (Vig. and Horsf.), 10 species, in Australia and the islands of the Indian ocean; *seisura* (Vig. and Horsf.), 8 Australian species; *myiagra* (Vig. and Horsf.), 14 species, in Australia and India; *hemichelidon* (Hodgs.), 2 species, in the hills of Nepal; *niltava* (Hodgs.), 20 species, in India and its archipelago; *musci-capina* (Linn.), with 70 species, in most parts of the old continent; and *setophaga* (Swains.), nearly 20 species, in North and South America. The last is a very active genus, pursuing swarms of flies from the top to the bottom of a tree in a zig-zag but nearly perpendicular direction, the clicking of the bills being distinctly heard as they snap up the insects in the course of a few seconds; the American redstart (*S. ruticilla*, Swains.), placed in the family *sylicolidae* by Prof. Baird (in his Pacific railroad report), is a good example of the genus.—There is probably no family of birds about which systematic writers on ornithology differ more than on that of the flycatchers. Prof. Baird follows

Burmeister in adopting the order *insectores*, and Cabanis in placing most of them in the suborder *clamatrices*; he calls the whole family *coleopterida*, of which the subfamily *tyrannina* is what chiefly interests us here. The fork-tailed and swallow-tailed flycatchers belong to the genus *milvulus* (Swains.); the Arkansas, Cassin's, and Couch's flycatchers to the genus *tyrannus* (Cuv.); the great crested, Mexican, Cooper's, and Lawrence's, to the genus *myiarchus* (Cab.); the black, pewee, and Say's, to the genus *sayornis* (Bonap.); the olive-sided to the genus *contopus* (Cab.); Traill's, the least, the small green-crested, and the yellow-bellied, to the genus *empidonax* (Cab.); the last four genera are included in the genus *myiobius* of Gray. The Canada and Bonaparte's flycatchers are warblers, belonging to the genus *myiodytes* (Aud.) or *setophaga* (Swains.); the solitary, white-eyed, warbling, yellow-throated, red-eyed, Hutton's, and the black-headed flycatchers are vireos; the blue-gray flycatcher belongs to the family of titmice, and to the genus *polioptila* (Solater). The flycatchers are active and fearless, and very beneficial to man by destroying flies, moths, and various insects and grubs injurious to vegetation and to animals.

FLYING FISH (*exocoetus*, Linn.), a genus of fishes belonging to the order *pharyngognathi* and the family *scomberesocidae* (Müller), containing, according to Valenciennes, 38 species. This genus is at once recognizable by its large pectoral fins, capable of being used as parachutes, and to a certain extent as wings; other fishes have the faculty of leaping out of the water and of sustaining themselves in the air for a short time, but the *exoceti* far excel these, and approach much nearer in this act the true flight of birds than does the flying dragon or the flying squirrel. Navigators in all tropical seas are familiar with these sprightly fishes, which relieve the monotony of ocean life as birds do the silence of the woods. The characters of the long pectorals, the strength of the muscles which move them, and the size of the bony arch to which they are attached, are the essential conditions of their flight. Numerous observations prove that these shining bands pursue their flights when no danger threatens, in the full enjoyment of happiness and security, for mere sport, and probably as a necessity of their structure. Their lot indeed would be far from enviable were their flights the frantic attempts to escape from pursuing bonitos and dolphins (*coryphæna*), for in the air their danger is quite as great from the albatross, frigate pelicans, petrels, and other ocean birds. This habit belongs to the same class of phenomena as the flying of the dragon and squirrel, the climbing of trees by the anabas, and the travelling across the land by the common eel. Humboldt drew attention to the great muscular force necessary for the flight of these fishes; he recognized that the nerves supplying the pectorals are three times as large as those going to the ventrals; the muscular power is sufficient to

raise them 15 or 20 ft. above the surface, and to sustain them with a velocity greater than that of the fastest ship for a distance of several hundred feet. The pectorals strike the air with rapid impulses, scarcely more perceptible than the quick vibrations of the humming bird's wing. Humboldt says they move in a right line, in a direction opposite to that of the waves, but other observers assert positively that they can turn nearly to a right angle from this course before settling into the water again; though they generally come out on the top of a wave, they can pass over several of their summits before descending. The size of the swimming bladder is enormous, occupying more than half the length of the body; though this, not communicating with the intestine, is of no advantage in making the exit from the water, it contributes to prolong the flight by rendering the body more buoyant. The flying faculty of these fishes, the pleasing spectacle of their troops sporting around the bows of vessels, the glittering of their beautiful colors in the tropical sun, the delicate flavor of their flesh, and the fact of their frequently leaping on board ships, have attracted the attention of mariners from early times; but until a comparatively recent period only two species were admitted by naturalists, who gave them a distribution as wide as the tropical and temperate seas. The order to which the flying fish belongs is characterized by having the lower pharyngeal bones united to form a single bone. The generic characters of *exocoetus* are: a head and body covered with scales, with a scaly keel on each flank; the pectoral fins nearly as long as the body; the dorsal over the anal; the head flattened, with large eyes; both jaws with small pointed teeth, and the pharyngeals with numerous compressed ones; upper lobe of the tail smaller than the lower; the fins without spines; the intestine straight, without pyloric caeca.—The common flying fish of the Mediterranean (*E. volitans*, Linn.) is recognized by its long white ventral

mouth small, the teeth in the anterior part of the jaw, the palate smooth, the tongue free, the gill openings large, and the branchial rays 10 to 12; the humeral bones are large and firmly articulated to the head, and the pectorals, which are attached to them, are so arranged that when the flexors contract the fins are spread horizontally, and are applied along the sides when the wings are shut; the movements do not differ from those of other fishes except in the freedom permitted by the articulation; the fin rays are very long, and not deeply divided; the ventrals, inserted in front of the middle of the body, are completely abdominal and well developed; the dorsal is small, low, and triangular; the anal very short, and the caudal deeply forked; the swimming bladder extends along the spine even under the last caudal vertebrae, protected by their lower bony arches, a disposition found in no other fish. The general color is a leaden gray, with greenish tints on the upper half of the body, and silvery white below; the pectorals have a wide whitish border; the dorsal is gray, the caudal brown, the anal bluish, and the ventrals whitish. The largest specimens are rarely more than 16 in. long, and they are found in all parts of the Mediterranean. The *E. volans* (Linn.) is found in so many parts of the world, that it may be called cosmopolitan. The average length is between 8 and 9 in.; the eyes are of moderate size, the teeth very small, the dorsal and anal fins long and low, the pectorals extending to the caudal, the ventrals very short and attached to the anterior third of the body; the color is rich ultramarine blue on the back, and silvery on the abdomen; the fins are of a darker blue, the pectorals being unspotted. There are five species on the coast of North America, which have been divided into three genera by Dr. Weinland. The common species (*E. arifrons*, Gmel.), found from the gulf of Mexico to the coast of New Jersey, is from 12 to 16 in. long, with dusky pectorals and ventrals, banded with brown in young specimens; the ventrals are longer than the anal, and nearer the vent; the dorsal and lower lobe of the caudal are spotted with brown and black. The New York flying fish (*E. noveboracensis*, Mitch.), about a foot long, has been found from the middle states to Newfoundland; the color above is dark green, the pectorals brown with the end bordered with white; the ventrals are very long, nearest to the vent, and the wings reach to the tail.—Some species have the lower lip much developed, with one or two tough appendages hanging from the chin; these have been separated as the genus *cypselurus*, and include two species of our coast. The *C. comatus* (Mitch.) has a black cirrus on the chin extending half the length of the body, which is about 5 in.; the pectorals do not extend to the end of the ventrals, the latter touching the caudal; it has been found from New York to the southern states. The *C. fuscatus*

European Flying Fish (*Exocoetus volitans*).

fins; the body is generally short and thick, robust in the pectoral region, rounded above, flattened on the sides; the head is large, the muzzle obtuse, the lower jaw the longer, the

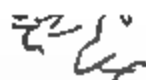
(Mitch.) has two appendages from the lower jaw; it is 3 to 5 in. long, and extends from New York to the gulf of Mexico; the pectorals are large, and the ventrals very long. The middling flying fish Dr. Weinland has made the type of a new genus *halocypselus*; this species (*H. mesogaster*, Weinland) is found in the West Indies, varying in length from 4 to 7 in.; the ventrals are very short, about one quarter as long as the pectorals, anterior to the middle of the body, between the anus and the pectorals; the lower jaw is angular.—The flying gurnard (*dactylopterus volitans*, Cuv.), a spiny fish of the family *triglida* or *sclerogenida*, has also been called flying fish by navigators. The species has been described as occurring in the Mediterranean, in the tropical seas, in the West Indies, and the gulf of Mexico, and along the American coast from Newfoundland southward; probably more than one species will be found over such an extended range. These flying fish or sea swallows behave very much like the *exocæti*, swimming in immense shoals, leaping out of the water for sport and for safety, preyed upon by marine and aerial enemies, and falling in consequence into equally

Flying Gurnard (*Dactylopterus volitans*).

cruel hands on board vessels which come within their range. From the rapid drying of their pectorals and their less muscular power, they fall into the water again sooner than do the true flying fish; their pectorals serve merely as parachutes. They vary from 6 to 8 in. in length.

FLYING LEMUR, *Coleugo*, or *Cat Monkey*, the common name of animals of the family *galeopithecida*, elevated into the order *pteropleura* or *dermoptera* by some authors; they evidently constitute the connecting link between the monkeys and the bats. In the single genus *galeopithecus* (Pall.) the dental formula, according to Owen, is: incisors $\frac{2}{2}$, canines $\frac{1}{1}$, premolars $\frac{2}{2}$, and molars $\frac{2}{2}$; the feet are all five-toed, without opposable thumbs, united by a small membrane, armed with claws, and adapted for climbing. The body is surrounded by a hairy lateral membrane, extending from the sides of the neck to the base of the feet, embracing the wrists, and continued between the legs, involving the tail as in many bats; this membrane, like that of the flying squirrel, serves as a parachute to sustain the animal in its astonishing leaps from tree to tree. The edges of the lower incisors are serrated like

the teeth of a comb; the eyes large and prominent, the ears moderate; there are two pairs of pectoral mammae. They are nocturnal animals, passing the day suspended from trees by the hind claws like bats; they are very active at night, climbing with facility, and springing



Flying Lemur (*Galeopithecus volans*).

from tree to tree for a distance of 100 yards; the females carry the young in the fold of abdominal integument, when travelling among the trees; their food consists principally of fruits, insects, small birds, and eggs; their movements on the ground are rather awkward. The largest species (*G. variegatus*, Geoffr.) is about the size of a cat, but slimmer; the color varies from light gray to russet, spotted and striped with black and light colors. All the species live in the East Indian archipelago. Though emitting a disagreeable odor, the flesh is considered palatable by the natives.

FLYING SQUIRREL (*pteromys*, Cuv.; Gr. πτερον, wing, and μυς, mouse), a genus of the family *sciurida*, differing from common squirrels principally in the expansion of the skin between the fore and hind feet, by means of which the animal sails in a descending line from one tree to another, supported as by a parachute. There are two subdivisions of the genus: *pteromys*, with rounded tail and complicated molar teeth; and *sciuropterus* (F. Cuv.), with flattened tail and molars simple as in other squirrels. The species of the United States and the single one found in Europe belong to the last subgenus. The dentition and general appearance are like those of squirrels; the head and ears are round, and the eyes large; there are four elongated toes with sharp claws, and the rudiment of a thumb, on the fore feet; five long toes, fitted for climbing, on the hind feet; the sailing membrane is attached in front to a slender movable bone about an inch long, extending at a right angle from the hand; the membrane is hairy on both sides. The common flying squirrel (*P.* or *S. volucella*,

Pallas) is about 10 in. long, of which one half is the tail; the color above is light yellowish brown, the tail being rather smoke-colored, and white beneath; the fur, as in all the species, is very soft and fine. It is a nocturnal animal, rarely appearing until sunset, at which time its gambols and graceful flights may be often seen in places frequented by it; the large eyes indicate its habits, which make it rather an uninteresting pet, as it is lively only at night; it is harmless and gentle, and soon becomes tame, eating the usual food of squirrels. There is nothing resembling the act of flying in its movements, as we see in the flying fish; it sails from a high to a lower point, a distance of 40 or 50 yards, and when it wishes to alight the impetus of its course enables it to ascend in a curved line to about one third of the height from which it descended; running quickly to the top of the tree, it redescends in a similar manner, and will thus travel a quarter of a mile in the woods in a few min-

tions, where rats and mice have not yet penetrated, this species lives familiarly in the walls of the log cabins, coming out at night in quest of food, and sometimes committing sad havoc among the miner's scanty stores. Other American species are the *P.* or *S. alpinus* (Rich.), from the Rocky mountains, resembling the last, but a little larger, and the membrane having a straight border; and the *P.* or *S. Oregonensis* (Bach), in Oregon and California, about the size of the northern species, with a very broad membrane.—The European species (*P.* or *S. volans*, Linn.), found in Siberia, Poland, and Russia proper, is a little larger than the *S. volucella*, whitish gray or cinereous above, and white below; it lives wholly on trees, eating the tender shoots of resinous and other trees. The species of *pteromys* inhabiting India and its archipelago attain a larger size than any of the preceding. The taguan (*P. petaurista*, Pall.) is as large as a half-grown cat; the male is bright chestnut above, and red beneath; the female brown above, whitish below. There are several species in Java, of which the best known are the *P. genibarbis* (Horsf.) and *P. sagitta* (Penn.). The former is remarkable for the radiated disposition of long slender bristles on the sides of the head; though living in a hot climate, the fur is thick and downy; the general color is gray above, with a tawny tint on the back, and white beneath; it is about as large as the common red squirrel. The second species, like the first, is rare, and lives principally on fruits; the color is brown above and white below. Several other species are described.

FOERSTER, Wilhelm, a German astronomer, born at Grünberg, Silesia, Dec. 16, 1832. He studied in Berlin and in Bonn, where he graduated in 1854. He became second assistant at the Berlin observatory in 1855, first assistant in 1860, professor in 1863, and director of the observatory in March, 1865. He is prominently connected with the most important astronomical periodicals, and secretary of the astronomical society, and since the close of 1868 has been at the head of the commission for establishing German weights and measures upon a metrical basis.

FŒTUS. See EMBRYOLOGY.

FOG, a body of aqueous vapor in the atmosphere, like the clouds seen in the sky above, but distinguished from them both by its position and by the manner of its formation. A large class of clouds result from the diminution of temperature produced by the elevation and expansion of moist air, and a small class is due rather to the cooling of the air by radiation in a horizontal direction to bodies of cooler air; while again a very important class arise from the radiation of heat vertically into the cold interstellar regions. To these simple causes also must be attributed the formation of a large class of fogs. On the other hand, the peculiar feature in the origin of a number, and especially of the heaviest

Flying Squirrel (*Sciuropterus Hudsonius*).

utes without touching the earth. Flying squirrels are gregarious, six or seven being found in a nest, and considerable numbers in the same hollow or artificial cavity, associating with bats and other nocturnal animals; the food consists of nuts and seeds, buds, and even meat and young birds. They produce from three to six young at a time, and have two litters in the southern states, in May and September. This species extends from Upper Canada and northern New York to the extreme southern limits of the United States, east of the Mississippi. The northern flying squirrel (*P.* or *S. Hudsonius*, Gmel.), found from Maine to Minnesota and to the north, is considerably larger; the length of the head and body is 8 in. and the tail $5\frac{1}{2}$; the color above is yellowish brown, mixed with cinereous, the hair lead-colored at the root, beneath white. It is common in Lower Canada; in the Lake Superior copper region, in the new and remote mining loca-

fogs that occur, consists in this, that the moist air radiates its heat downward to a comparatively cold body of either water, earth, or air. The former case occurs when the earth, after a period of low temperature, becomes quite cold, and the winds then waft warm moist air over the cold regions, while the small conducting power of the earth, ice, or snow does not allow its surface at once to follow the change in temperature. Fogs of the second class occur only during very clear nights; the radiation from the earth then takes place with great freedom, and the moist air by this means coming into contact with the cold earth becomes greatly reduced in temperature, and after depositing a heavy dew lies still in the valleys over the whole surface of the ground. To this body of cold air the superincumbent atmosphere radiates heat as freely as to the outer regions of the air, and even more rapidly because of its nearness. When by this process the temperature is reduced to the dew point, the aqueous vapor begins to condense as fog, the particles of which attach themselves to neighboring solid bodies, such as leaves and branches of trees, but in a manner slightly different from the formation of dew. The third class of fogs, that produced by the radiation of atmospheric heat to a body of cold water, may occur in two ways: either warm air may be wafted over bodies of cold water, or currents of cold water may under-run bodies of warm moist air. The fogs on the coasts of New England, Nova Scotia, and Newfoundland, and those of the Gulf stream, belong in great measure to the former class, as the motion of the cold ocean currents must be considered quite slight in comparison with the rapidly moving winds. To the latter class belong fogs over rivers whose cold waters are flowing rapidly toward warmer regions. These are important features of the lower portions of the Mississippi, and have been well studied by Dr. W. M. Carpenter. (See "American Journal of Science" for 1848.)—Concerning the exact condition of the vapor when in the state that constitutes a fog, much has been written since the first announcement by Kratzenstein of his theory of the existence of fog vesicles as distinct from rain or dew drops. Notwithstanding the labors of Kämtz (1836), Meissner (1867), Muhry (1878), and others, it must be admitted that this theory is still supported by too few minutely accurate observations to allow its unqualified adoption; and it is safer to presume that the particles of a fog are maintained floating in the air simply by the resistance offered by the atmosphere to the fall of minute spherical bodies.—The dry fog that constitutes a characteristic feature of the North American Indian summer is not essentially different from the moor smoke (*Moorrauch*) of Europe, and has been satisfactorily traced to the burning of extensive tracts of forest and prairie land. From such fires the diluted smoke spreads with the winds over im-

mense areas. The progress of these masses of smoke in the United States and Canada has of late years been very closely followed by the officers of the weather bureau of the army signal office, who have frequently been able to predict this phenomenon. The great fires of 1871 in the northwest, and indeed throughout the whole country, gave rise to remarkable exhibitions of this haze. An extraordinary dry fog is recorded to have covered the whole of Europe in 1788 for nearly two months.

FOGELBERG, *Bengt Erland*, a Swedish sculptor, born at Gothenburg about 1787, died in Trieste, Dec. 21, 1854. He was the son of a bronze founder, studied in Stockholm and Paris, and spent upward of 30 years in Rome, taking rank next to Thorwaldsen. The subjects of his most celebrated works are from Greek and Scandinavian mythology, many of which are in the museum and in the private galleries of Stockholm. He also made bronze statues of Gustavus Adolphus and Charles XIV. (Bernadotte).

FOGARAS, a market town of Transylvania, capital of a district of the same name, on the left bank of the Aluta, 82 m. W. N. W. of Kronstadt; pop. in 1867, 4,714. It has a strongly fortified castle, built at the beginning of the 14th century and restored in the early part of the 17th by Bethlen Gábor. Fogaras gives title to the United Greek archbishop of the Roumans in the lands of the Hungarian crown; but his residence is at Blasendorf. On July 12, 1849, Bem was defeated here by the Russian generals Engelhardt and Lüders.

FOGGIA. I. Also called **CAPITANATA**, a province of southern Italy, bounded N. and E. by the Adriatic, and bordering on the provinces of Bari, Potenza, Avellino, and Campobasso; area, 2,955 sq. m.; pop. in 1872, 319,164. It comprises the three districts of Bovino, Foggia, and San Severo. The Gargano peninsula forms in the southern part the gulf of Manfredonia, on which opens the vast plain of Foggia. The Gargano range extends over 800 sq. m. on the S. E. side of the province, and the branches of the main Apennines rise on the S. W. Between the barren mountainous regions are exceedingly fertile valleys. The chief rivers are the Ofanto, Fortore, Candellaro, Cervaro, and Carapella. The vine and the olive are extensively cultivated, and among the other products are grain, tobacco, licorice, hemp, and flax. The breeding of cattle, particularly of sheep, is extensively pursued. II. A city, capital of the province, in the plain of Apulia (La Puglia), 80 m. N. E. of Naples, connected by rail with Ancona, Naples, and Bari; pop. in 1872, 38,188. It is well built, with wide clean streets, handsome houses and gateways, but no walls. It has about 20 churches, a cathedral originally Gothic, but rebuilt in a different style after its partial destruction by an earthquake in 1781, several antiquities, a public library, and a theatre. The main streets and public squares are under-

mined by capacious vaults called *fosses*, in which quantities of grain are stored from year to year. There are many schools, including one of agriculture and a seminary for girls. The city is surrounded by fine plantations and vineyards, but the climate is unhealthy. It has a considerable trade in cattle, cheese, capers, wine, oil, and other agricultural products, and is a staple market for corn and wool. One of the principal fairs in the kingdom is held here in May. Foggia is supposed to have been founded about the 9th century, and peopled from the ancient Arpi or Argyrippa, 5 m. distant, the ruins of which are still visible. It was one of the favorite residences of the emperor Frederick II., who built a palace here in 1223. A gateway of this palace and a large well sunk by Frederick still remain. Under the walls of the city, Manfred, Frederick's natural son, defeated the legate of Pope Innocent IV. and compelled him to sue for peace. Charles I. of Anjou built a fortified palace here, in which he and his son Philip died.

FOIX, a town of S. France, capital of the department of Ariège, on the left bank of the river Ariège at its junction with the Arget, in a narrow valley at the foot of the Pyrenees, 404 m. S. of Paris, and 43 m. S. by E. of Toulouse, with which it is connected by rail; pop. in 1866, 6,746. It has considerable trade and various manufactures, the principal of which is iron. It was founded probably about the 2d century, and in the 11th century became the capital of a county, and was a stronghold of importance. The county of Foix nearly corresponded to the department of Ariège.

FOIX, Counts of, a French family conspicuous from the 11th to the beginning of the 16th century.—**RAYMOND ROGER** reigned from 1188 to 1223. He engaged in the third crusade among the followers of Philip Augustus, and distinguished himself by his bravery at the taking of Acre. After his return to France he sided with the count of Toulouse and the Albigenses against the crusading forces led by Simon de Montfort, and contributed to the raising of the siege of Toulouse, during which Montfort was killed.—His son, **ROGER BERNARD II.**, styled the Great, who succeeded him in 1223, followed his example, but in 1229 was forced into submission to the king and the pope.—**ROGER BERNARD III.** (1265–1302) gained considerable reputation as a troubadour, but was unsuccessful in his wars with the kings of France and Aragon; he was several times imprisoned.—**GASTON II.** (1315–1343) did good service to Philip VI. of France in his war with the English, and assisted Alfonso XI. of Castile against the Moors.—**GASTON III.**, son of the preceding, succeeded his father in 1343, when only 12 years old. He was called Phœbus on account either of his light hair or of a sun he bore on his escutcheon. He signalized himself against the English in Guienne and Languedoc, and in 1356 was imprisoned for a while at Paris for complicity in the intrigues of Charles the Bad

of Navarre, his brother-in-law. On his release he fought bravely in the ranks of the Teutonic knights against the Prussians. Returning to France in 1358, he contributed to the defeat and destruction of the rebellious Jacquerie, who were besieging the royal château at Meaux. In 1362, by victory over the count d'Armagnac, he secured for himself possession of Béarn; and the magnificence of his court at Orthez and afterward at Pau was admired by Froissart. In 1380 he was appointed governor of Languedoc by Charles V., but his dignity was contested by the duke of Berry, whom he defeated at Revel. Gaston Phœbus was a famous huntsman, and left a book entitled *Miroir de Phœbus, des déduits de la chasse des bestes sauvages et des oyseaux de proie* (fol., Paris, 1507).—**GASTON IV.** (died in 1472) made himself conspicuous by services as well as hostility to both Charles VII. and Louis XI. He married Eleonora, princess and afterward queen regnant of Navarre, who died in 1479; and her heiress Catherine de Foix marrying Jean d'Albret in 1484, the county of Foix was henceforth united with Navarre under that house. Her rights to the county were, however, long disputed by her uncle, Jean de Foix, viscount of Narbonne. A son of the latter was the hero and victim of the battle of Ravenna (April 11, 1512). (See **GASTON DE FOIX**.)

FOKIEN, a maritime province of China, bounded N. by Chekiang, W. and N. W. by Kiangsi, S. by Kwangtung, and S. E. by the China sea; area, 58,480 sq. m.; pop. estimated in 1842 at 26,000,000. It abounds in bays and islands, including Amoy, Haitan, and part of Formosa. The Min and its tributaries are the principal rivers. The country, though generally mountainous, is exceedingly well cultivated. The hills are cut in terraces, and the valleys are beautiful and fertile; and agriculture is greatly promoted by artificial irrigation. The products are excellent black tea, rice, wheat, barley, sweet potatoes, camphor, sugar, iron, indigo, tobacco, and alum. Porcelain and cloth are made. The chief imports are corn, drugs, fruits, and salted meats. Capital, Foochow.

FOKSHANI, a frontier town of Roumania, 104 m. N. E. of Bucharest, divided by the river Milkov between the provinces of Wallachia and Moldavia, the smaller part belonging to the latter; pop. estimated at 20,000. The best Moldavian wine is produced in its vicinity. A congress of Russian and Turkish diplomatists was held here in 1772. Near the town the Russians and Austrians defeated the Turks, July 21, 1789.

FÖLDVÁR, or **Duna-Földvár** (Földvár-on-the-Danube), a town of Hungary, in the county of Tolna, on the right bank of the Danube, 47 m. S. of Buda; pop. in 1869, 12,382. It commands the communication between the upper and lower Danube, and is a depot for salt. The surrounding district is fertile, producing grains and wine; and the town has a considerable sturgeon fishery.

FOLEY, John Henry, an Irish sculptor, born in Dublin, May 24, 1818, died in London, Aug. 28, 1874. At an early age he entered the school of the royal Dublin society, and in 1834 became a student at the royal academy in London. In 1839 he first appeared as an exhibitor there, with his models of "Innocence" and the "Death of Abel." Among the most popular of his imaginative works are: "Ino and the Infant Bacchus" (1840), "Lear and Cordelia" and the "Death of Lear" (1841), "Venus rescuing Æneas" (1842), and "Prospero relating his Adventures to Miranda" (1843). For several years he was kept busy with commissions for portrait statues, producing, among many others, those of Edmund Burke and Oliver Goldsmith, for Dublin. One of his latest works was the colossal statue of Prince Albert, for the memorial in Hyde Park, of which also he executed the group "Asia."

FOLIGNO (anc. *Fulginium* or *Fulgina*), a walled city of central Italy, in the province and 20 m. S. E. of the city of Perugia, in a beautiful valley of the Apennines; pop. in 1872, 21,686. It is large, but poorly built, and is famous for its manufactures of silks, woollens, soap, bleached wax, and playing cards. In 1831-'2 it was nearly destroyed by earthquakes. The celebrated picture of Raphael, *La Madonna di Foligno*, took its name from this place. A monument to the painter Alunno was erected here in 1872.

FOLKESTONE, a market town, seaport, and parish of Kent, England, built partly on the level shore and partly on a cliff on the straits of Dover, 7 m. S. W. of Dover, of which it is a sub-port, and 83 m. S. E. of London by the Southeastern railway; pop. in 1871, 12,694. It was anciently a place of importance, and still has traces of Roman defences. In the 18th century it was the seat of extensive fisheries, and drew still greater wealth from various branches of the smuggling trade, on the suppression of which it fell into decay. Since the opening of the railway, however, which connects at this port with a line of steam packets for Boulogne, it has recovered its prosperity. The harbor has been improved, a fine pier has been built, a custom house established, new warehouses and hotels have been erected, and streets opened. It is said that the town formerly contained five churches, four of which were swept away by the sea; there are now two. An old castle, founded by the Saxon kings of Kent and rebuilt by the Normans, has been almost totally destroyed, together with the height on which it was erected, by the encroachment of the sea. It is much resorted to for sea bathing.

FOLLEN, August, afterward **Adolf Ludwig**, a German poet, born in Giessen, Hesse-Darmstadt, Jan. 21, 1794, died in Bern, Switzerland, Dec. 26, 1855. After studying philology and theology in his native town, he served in the campaign of 1814 against France. On his return he studied law for two years at Heidelberg, in

1817 began to edit the *Allgemeine Zeitung* at Elberfeld, in 1819 was involved in political agitations for which he was imprisoned two years in Berlin, went thence to Switzerland, and subsequently became a citizen of Zürich. In 1847 he purchased the castle of Liebenfels in Thurgau, whence in 1854 he removed to Bern. He translated the Homeric hymns (1814), and a volume of old Latin ecclesiastical hymns (Elberfeld, 1819), and published other works.

FOLLEN. I. Charles, an American clergyman, brother of the preceding, born at Romrod in Hesse-Darmstadt, Sept. 4, 1795, perished in the conflagration of the steamboat Lexington in Long Island sound, on the night of Jan. 13, 1840. He was educated at Giessen, where he was honored for his liberal sentiments, and attached himself to the *Burschenschaft*, which fell under suspicion as aiming at political revolution. He wrote a defence of the *Burschenschaft*, and many patriotic songs, which, with others by his brother August, were published at Jena in 1819. In 1818 he received his degree as doctor of civil and ecclesiastical law from the university at Giessen, where he remained for some time as a lecturer on jurisprudence. He then went to Jena to lecture at the university, and was accused of complicity in the assassination of Kotzebue. He was twice arrested, but after a rigid examination was honorably acquitted. About the same time he was arrested on a charge of being the author of the "Great Song," which was considered seditious, but no evidence was found against him, though in fact he was one of its composers. He was, however, forbidden to continue his lectures at Jena. He returned to Giessen, but learning that he was again to be put under arrest, he fled to Paris, and thence went to Switzerland, and was appointed professor of Latin and history in the cantonal school of the Grisons at Coire. His lectures having given offence by their Unitarian tendency to some of the Calvinistic ministers of the district, he asked a dismissal and obtained it, with a testimonial to his ability, learning, and worth. The university of Basel then appointed him lecturer upon law and metaphysics. While he was at Coire and Basel a demand was made by the German governments for his surrender as a revolutionist. It was twice refused, but on its renewal a third time in a threatening form, Basel yielded, and a resolution was passed for his arrest. He escaped from the city, and at the close of 1824 sailed for New York. He soon learned the English language, and in December, 1825, he received the appointment of teacher of German at Harvard college. In 1828 he was appointed teacher of ecclesiastical history and ethics in the divinity school, having in the mean time been admitted as a candidate for the ministry. In 1830 he was appointed professor of German literature at Harvard, which post he held for five years. In 1836-'7 he was pastor of the first Unitarian society in New York, and in 1839 he took charge of a church in East Lexing-

ton, Mass. In 1836 he published "Psychology" and an "Essay on Religion and the Church." He was a contributor to reviews, and occasionally gave courses of lectures. His sermons and lectures, and an unfinished sketch of a work on psychology, with a memoir of his life by Mrs. Follen, have been published (5 vols., Boston, 1841). II. *Eliza Lee*, an American authoress, wife of the preceding, and daughter of Samuel Cabot, born in Boston, Aug. 15, 1787, died at Brookline, Mass., Jan. 26, 1860. She married Dr. Follen in 1828. Her principal publications are: "Selections from Fénelon" and the "Well Spent Hour" (1828); "The Skeptic" (1835); "Married Life," "Little Songs," and "Poems" (1839); "Twilight Stories" (1859); and a second series of "Little Songs" (1859).

FONBLANQUE. I. *Albany William*, an English journalist, born in 1797, died in London, Oct. 13, 1872. He was the son of an eminent lawyer, and studied for that profession, but soon became a political writer. After contributing to the "Morning Chronicle," he became editor of the "Examiner" in 1820, succeeding Leigh Hunt, and conducted it with great ability till 1846. In 1837 he published "England under Seven Administrations" (3 vols.), a collection of his contributions to the "Examiner." In 1852 he became director of the statistical department in the board of trade. His "Life and Labors," edited by his nephew, E. B. de Fonblanque, was published in 1874. II. *John Samuel Martin*, an English lawyer, brother of the preceding, born in London in March, 1787, died there, Nov. 3, 1865. He was educated at the Charterhouse and at Caius college, Cambridge. He obtained a commission in the army, and served in Spain, Italy, and the United States, and was taken prisoner in the battle of New Orleans. In 1816 he was called to the bar, and the year after was made a commissioner of bankruptcy, in which position he worked and wrote vigorously for a reform in the system. In 1823, in connection with Dr. Paris, he published a valuable treatise on "Medical Jurisprudence," and in 1826, with Sutton Thorpe and Richard Goff, he started the "Jurist," to advocate amendment of the laws.

FOND DU LAC, a S. E. county of Wisconsin, at the S. end of Lake Winnebago; area, 754 sq. m.; pop. in 1870, 46,273. It is drained by Fond du Lac river and other streams. A steep ledge of limestone, running from N. E. to S. W., divides the county into two unequal portions, the easternmost of which is heavily timbered, while the other contains extensive prairies. The soil is calcareous and generally fertile. The Wisconsin division of the Chicago and Northwestern railroad, the Sheboygan and Fond du Lac, and the Northern division of the Milwaukee and St. Paul, pass through the county. The chief productions in 1870 were 1,615,266 bushels of wheat, 287,400 of Indian corn, 879, 515 of oats, 60,735 of barley, 242,961 of potatoes, 76,027 tons of hay, 1,095,482 lbs.

of butter, 274,137 of wool, and 49,825 of hops. There were 11,621 horses, 14,273 milch cows, 13,850 other cattle, 66,084 sheep, and 12,917 swine; 4 manufactories of agricultural implements, 8 of boots and shoes, 28 of carriages and wagons, 7 of cheese, 9 of clothing, 7 of furniture, 4 of iron castings, 10 of engines and boilers, 1 of linseed oil, 12 of saddlery and harness, 9 of sashes, doors, and blinds, 12 of tin, copper, and sheet-iron ware, 5 of cigars, 3 planing and 18 saw mills, 4 tanneries, 2 currying establishments, and 19 flour mills. Capital, Fond du Lac.

FOND DU LAC, a city and the capital of Fond du Lac county, Wisconsin, situated at the S. end of Lake Winnebago, 60 m. N. by W. of Milwaukee; pop. in 1860, 5,460; in 1870, 12,764, of whom 4,029 were foreigners. It is built on ground ascending gradually from the lake, and interspersed with groves. An interesting feature of the city is the numerous artesian wells, which supply water of great purity and excellence. One of these yields magnetic water, and is noted for its curative properties. The buildings are partly of wood and partly of brick. The chief public edifices are an extensive hotel, a fine hall, a large high school building, and a fine post office building. Fond du Lac is surrounded by a rich agricultural country, and ships large quantities of hay and many horses and cattle to the Lake Superior mining region. It has communication by steamboat with Green bay and with points on the Fox and Wolf rivers, and by rail with all points through the Wisconsin division of the Chicago and Northwestern railroad and the Sheboygan and Fond du Lac railroad, and there is also an air-line road to Milwaukee. The manufactories include 16 saw mills, 2 shingle mills, 4 sash and door factories, 3 grist mills, 3 founderies, 1 manufactory of agricultural implements, 15 or 20 carriage and wagon factories, and 1 blast furnace. The car shops of the Chicago and Northwestern railroad employ about 400 men. There is a national bank with a capital of \$100,000, and two savings banks having each \$50,000 capital. The city is divided into five wards. In 1872 there were 47 public schools, viz., 1 high, 4 grammar, and 42 primary, having 50 teachers and an average attendance of 8,020 pupils. The total expenditure for school purposes was \$92,569, of which \$18,871 were for teachers' wages. There are 15 churches, and 2 daily, 1 semi-weekly (German), and 5 weekly (2 German) newspapers.

FONSECA, *Eleanora Placentel de*, marchioness, an Italian martyr, born in Naples in 1758, executed July 20, 1799. She belonged to an illustrious family, and was celebrated for her beauty, poetical talent, and learning. In 1784 she became the wife of the marquis Fonseca and a lady in waiting of Queen Caroline of Naples, whose favor she soon forfeited by her remarks on her majesty's intimate relations with the minister Acton. After the flight of the royal family in 1798, the marchioness was prominent as a partisan of the French, and

conspicuous by eloquent public addresses; and on the restoration of the Neapolitan monarchy in 1799 she was sentenced to death on the gallows at the instigation of Queen Caroline, upon the ground of her having contributed to the anti-royalist *Monitore Napoletano*. Her execution became the signal of wholesale massacres and imprisonments.

FONTAINE, Jean de la. See **LA FONTAINE**.

FONTAINEBLEAU, a town of France, in the department of Seine-et-Marne, 85 m. S. S. E. of Paris, on the Southeastern railway, in the midst of the forest to which it gives its name; pop. in 1866, 10,787. It has a college, a public library, three handsome barracks for cavalry and infantry, a hospital founded by Anne of Austria, an asylum for girls established by Mme. de Montespan, an obelisk erected on the marriage of Louis XVI. with Marie Antoinette, and the old residence of Gabrielle d'Estrées. Its manufactures of porcelain and earthenware have some reputation; and the delicious grapes

Château of Fontainebleau.

gathered in the vicinity, especially at Thomery, and celebrated under the name of *chasselas de Fontainebleau*, are the object of a brisk and profitable trade. But the town owes its celebrity to its royal château, a magnificent pile of various kinds of architecture, which has been the residence of several monarchs. This château, originally founded by Robert the Pious toward the end of the 10th century, was rebuilt by Louis VII. in the 12th, and embellished by Philip Augustus, Louis IX., and others. Francis I. had it entirely renovated and enlarged by artists brought from Italy. Rosso, Primaticcio, Nicolò dell' Abbate, Leonardo da Vinci, Andrea del Sarto, and Benvenuto Cellini ornamented it with their works, important remains of which may still be seen. It was improved by Henry IV. and all his successors. Napoleon I. spent here 8,000,000 francs between 1804 and 1813. Louis Philippe completely restored it and put it in splendid order

from 1837 to 1840, and Napoleon III. did not neglect it. It is in fact a collection of palaces of different epochs and styles, and its ornaments, pictures, and statuary are of the highest excellence. Its library is invaluable. This château has been the scene of many historical events. Philip IV., Henry III., and Louis XIII. were born in it. Christina of Sweden inhabited it during her sojourn in France; and it was here that in 1657 her favorite Monaldeschi was put to death by Santinelli. Here an alliance with Sweden was signed in 1661, and here in 1685 Louis XIV. signed the revocation of the edict of Nantes. Pope Pius VII. was confined within its walls for 19 months (1812-'14); and Napoleon, who had signed here his abdication, April 11, 1814, bade farewell on the 20th to his old guard at the principal entrance of the palace, known as *la cour du cheval blanc*. He signed his second and final abdication here, June 22, 1815.—The forest of Fontainebleau (area, 41,000 acres), which was originally

called the forest of Bière or Bièvre (*Sylva Bieria*), is as fine as any in France, and abounds in game. It is adorned with statues, temples, lakes, waterfalls, and fountains. Its varied and picturesque scenery is highly appreciated by travellers and landscape painters, while its quarries supply the capital with most of its paving stones. An *Histoire de la forêt de Fontainebleau* was published by Paul Donner in 1873.

FONTANA, the name of many Italian painters of the 16th and 17th centuries, prominent

among whom was PROSPERO (1512-'97), the instructor of the Carracci. He was one of the most prolific painters of the Bolognese school, but was hasty and reckless in his work. His masterpiece is the "Adoration of the Magi" in the church of Santa Maria delle Grazie in Bologna, which has been described as approaching the style of Paul Veronese. His daughter LAVINIA (1552-1614) attained almost the excellence of Guido in some of her portraits.—Famous among the architects of the Fontana family was DOMENICO (1548-1607), who finished the cupola of the basilica of St. Peter, placed the stupendous obelisk which had been brought from Egypt in the reign of Caligula on the piazza of St. Peter (1586), despite great difficulties, and was ennobled and magnificently rewarded by the pope. He also designed the library of the Vatican and completed the pontifical palace of Monte Cavallo. Clement VIII. having disgraced him on account of a false

charge of his having acquired his fortune dishonestly, he spent the latter part of his life in Naples.—Another eminent architect, CARLO (1634–1714), was employed in Rome under seven successive popes. Among his best known works are the Cibo and Ginetti chapels and the Grimani and Bolognetti palaces, the latter since known as the palazzo Torlonia.

FONTANES, Louis, marquis de, a French writer, born in Niort, March 6, 1757, died in Paris, March 17, 1821. Going to Paris when still very young, he contributed some poetical pieces to the *Mercur de France* and the *Almanach des muses*, but his reputation began with his translation of Pope's "Essay on Man," published in 1783. On the breaking out of the revolution he joined the moderate party, and in 1793 wrote the petition which the citizens of Lyons presented to the convention against the bloody tyranny of Collot d'Herbois. After the 9th Thermidor he became one of the contributors to the *Moderateur*, a newspaper in the royalist interest. After the 18th Fructidor he took refuge in England, where he met Chateaubriand, and a lasting friendship grew up between them. Allowed to return to France after the 18th Brumaire (November, 1799), he was appointed by the first consul to deliver a panegyric on Washington. He became a member of the legislative body in 1802, and was chosen its president in 1804. On the reestablishment of the French university in 1808, Napoleon placed him at its head with the title of grand master, and in 1810 appointed him senator. Fontanes, who had always been a royalist at heart, deserted his protector in 1814, voted against him in the senate, and joined the new king. He thus secured the tenure of his offices and dignities, and was promoted to the peerage. During his later years he devoted his leisure hours to an epic, *La Grèce délivrée*, which he did not complete. His adopted son having been killed in a duel, he died broken-hearted. His finished style of oratory and the purity and terse elegance of his poetry have given him the title of "Racine's last descendant." A collection of his speeches was published in 1821, and his works were edited by Sainte-Beuve, with a biography (2 vols. 8vo, 1837).

FONTANGES, Marie Angélique de Scoraille de Roussille, duchess de, a mistress of Louis XIV., born in the district of Rouergue in 1661, died in Paris, June 28, 1681. A member of a noble but impoverished family, she went to the French court as a maid of honor of the queen dowager, and became through her remarkable beauty Mme. de Montespan's successor as chief favorite of the king. Her discarded rival characterized her as a provincial statue. Her extravagance knew no bounds; the king supplied her with 500,000 francs a month, which was hardly sufficient for her wants. She brought into fashion a head dress arranged with leaves and ribbons, which was adopted all over Europe under her name. Louis XIV. conferred upon her the rank of duchess, but

became indifferent to her after the loss of her beauty in childhood. She retired to the abbey of Port Royal, where the king paid her a visit in her last moments.

FONTARABIA. See FUENTERRABIA.

FONTENAY-LE-COMTE, a town of France, formerly the capital of a department in Poitou, now in the department of Vendée, 33 m. S. E. of Napoléon-Vendée; pop. in 1866, 8,062. It has several remarkable churches, a college, four convents, a fine theatre, and three yearly fairs, and carries on a considerable trade in wine, staves, charcoal, leather, linen, coarse cloth, cordage, and timber. During the French revolution its name was changed to Fontenay-le-Peuple. In a public square is an ancient fountain, from which the town takes its name.

FONTENELLE, Bernard le Bovier or le Bouyer de, a French writer, born in Rouen, Feb. 11, 1657, died in Paris, Jan. 9, 1757. He was the nephew of Corneille by his mother. He studied law, but not succeeding in his first suit devoted himself to literature. His first performances were light poems, pastorals, and plays; his tragedy of *Aspar*, which appeared in 1680, was hissed by the public, and ridiculed by Racine and Boileau. In 1683 he published the *Dialogues des morts*, which made the beginning of his reputation. His *Entretiens sur la pluralité des mondes* (1686) and *Histoire des oracles* (1687), the latter an abridgment of a Latin work by Van Dale, a Dutch author, rendered him popular among those who were fond of scientific matters expounded in an elegant and somewhat affected style. In 1688 he published *Poésies pastorales*. His *Histoire de l'académie des sciences* (1696–'99) and *Éloges des académiciens* (1708–'19) are still admired for their clearness and elegance. In 1699 he was elected perpetual secretary of the academy.

FONTENOY, a village of Belgium, in the province of Hainaut, 5 m. S. E. of Tournay; pop. 800. It is noted for a victory of the French over the English, Dutch, and Austrians, May 11, 1745, fought by the latter for the relief of Tournay, then besieged by the French. The French, 76,000 strong, led by Marshal Saxe and animated by the presence of Louis XV. and the dauphin, were posted on a hill with Fontenoy before them, the village of St. Antoine and the river Scheldt on the right, and a small wood on the left. Their naturally strong position was so fortified as to be deemed almost impregnable. The allies, numbering 50,000, more than half of whom were English, were under the duke of Cumberland. They attacked the French outposts on the 10th, and early the next morning began the engagement by a fierce cannonade. The Dutch undertook to carry St. Antoine and Fontenoy by assault, but were driven back in disorder. Gen. Ingoldsby, who had been ordered to pierce the wood with a British division, retired with dishonor, while the duke of Cumberland, with 14,000 British and Hanoverian infantry marching in columns of 80 or 40 front, led the assault upon the

main body. With bayonets fixed they plunged down a ravine which separated them from the French line, and, while artillery mowed down their ranks from right and left, marched steadily forward with rapidly diminishing numbers but unflinching courage. They gained the hill in a solid mass, cut down everything before them, and had nearly won the day by intercepting the French retreat to the Scheldt, when Saxe, having in vain urged the king to fly, collected his force for a last effort. Four pieces of cannon were brought to bear upon the British front, while the household troops, the reserve, and foremost of all the brigade of Irish exiles, charged on either flank. Exhausted and unsupported, the English fell back. Their cavalry came to the rescue, and they reached the allied position with unbroken ranks, having twice cut through more than five times their number. The allies retreated to Ath, leaving about 8,000 killed, wounded, and prisoners, while the French acknowledged an almost equal loss. The young duke de Gramont was one of those who fell. The speedy fall of Tournay and the conquest of Ghent, Bruges, Ostend, and Dendermonde were the fruits of Marshal Saxe's victory.

FONTEVRAULT (Lat. *Fons Ebraldi*), Order of, a monastic order in the Roman Catholic church, founded about the year 1100 by Robert of Arbrissel. The abbey of La Roe, in the forest of Craon, was an establishment of regular canons, which also owed its origin to Robert of Arbrissel. It had ceased for some time to be governed by him when he withdrew with three other renowned preachers to the desert vale of Fontevault, on the Vienne, near its junction with the Loire. There, beside the burial place of the Plantagenets, he laid the foundation of four distinct establishments: Grand Montier for nuns, St. Lazare for lepers, St. Magdalen for penitent women, and a monastery for men. To the inmates, called for a long time "the poor of Christ," he gave the rule of St. Benedict, somewhat modified. This foundation, as well as the modified rule, was approved in 1106 by the council of Poitiers, and the bishop of that city obtained from Pope Pascal II. the confirmation of the new order on March 26 of the same year. The most remarkable feature in its constitution was that the whole order was governed by a woman, the founder himself vowing obedience with all his followers to Herlande de Champagne, the first abbess general. Robert then devoted himself exclusively to the extension of the order, which soon spread over the continent of Europe and had several houses in England. It numbered 3,000 monks and nuns at the death of the founder in 1117. The severe discipline maintained at Fontevault had obtained for the order many privileges from the popes. The most rigorous of its observances were abolished by Eugenius III. In 1459 dissensions arose in the order about some contemplated reforms; and the monks, casting aside the rule

of St. Benedict, adopted that of St. Augustine, and called themselves canons regular. The 26th abbess general, Mary of Brittany, in 1475 drew up a new constitution combining the statutes of the founder with what was most appropriate in the rules of St. Benedict and St. Augustine; and it was approved by Sixtus IV. After much opposition, this constitution was adopted by the order in 1507, the recusants forming an independent congregation. The monks, having endeavored in 1520 to submit the authority of the abbess to the control of a council, were condemned by the local authorities, and the sentence was ratified in 1523 by Clement VII. A new effort to shake off this female yoke was made under the pontificate of Urban VIII., who favored such a reform. But an ordinance of Louis XIII., enjoining the strict observance of the bull of Sixtus IV., put an end to all hopes of change. The order was suppressed during the French revolution, and has not been revived.—The title of abbess of Fontevault was always conferred on a lady of royal blood. The members were mainly recruited from the upper classes; and to the nuns were intrusted the education of the royal princesses, *filles de France*. At its most flourishing period the order of Fontevault was divided into four provinces: that of France, composing 5 priories; that of Aquitaine, 14; that of Auvergne, 13; and that of Brittany, 13. Within the central establishment at Fontevault were five churches, the vast courts and buildings forming a little city in themselves. Four of the churches and several of the outbuildings were destroyed in the French revolution. The remaining church edifice, one of the largest in France, and what remains of the monasteries, are now used as a central prison for 2,000 men and boys, from 11 neighboring departments. Napoleon III. in 1867 offered to Queen Victoria the statues of Henry II., Richard I., Eleanor of Aquitaine, and Isabel of Angoulême, which adorn their tombs in the adjoining mausoleum; but the director of the establishment refused to give them up to the English agent, and all France protested against the spoliation.

FONVIELLE, *Wlfrid de*, a French author, born in Paris in 1828. He taught mathematics and devoted himself to the popularization of scientific subjects, to journalism, and to aeronautics. His principal works are: *L'Homme fossile* (1865), *Les merveilles du monde invisible* (1866), *Éclairs et tonnerres* (1867), and *L'Astronomie moderne* (1868), some of which have been translated into English. He published in 1870 a narrative of his aeronautic voyages, which is included in Glaisher's "Travels in the Air" (London, 1871).

FOOCHOW, *Fuhchau*, *Foochoo*, or *Foochow-foo* (called also by the inhabitants *Hok-chun*, "Happy Region"), a city of China, capital of the province of Fokien, and one of the ports open to foreign trade, in lat. 26° 5' N., lon. 119° 20' E., 150 m. N. N. E. of Amoy, 420 m. N. E. of

Canton, and 375 m. S. S. W. of Shanghai; pop. variously estimated from 600,000 to 1,250,000. It stands on a plain about $2\frac{1}{2}$ m. from the N. bank of the Min and 25 m. from its mouth, surrounded by an amphitheatre of hills about 4 m. distant, and defended by a wall 7 m. in circuit, 20 to 25 ft. high, and 12 to 20 ft. thick. The city has seven gates, over which are high towers. Outside of each gate are large suburbs. The most extensive are those on the south, known by the name of Nanti, which extend for 4 m. southward, and along both sides of the river. They communicate by two bridges resting on a small densely populated island called Chungchow (Middle island). The northern bridge, called the bridge of 10,000 ages, or big bridge, said to be 800 years old, is about a quarter of a mile long and supported by nearly 40 piers placed at unequal distances. Across these piers are immense stones, 3 ft. square and about 45 ft. long, and over these a granite platform. The sides are lined with shops. The city proper is regularly built, but the streets, though paved with granite and in many instances planted with trees, are exceedingly filthy, narrow, and infested with beggars whose squalid and loathsome appearance is beyond description. The houses are usually of wood, one story high, with tiled roofs. A semi-transparent shell ingeniously arranged in rows is sometimes used for windows. Great numbers of the inhabitants live in boats on the river. There are some handsome buildings, among which are the residences of the civil and military officials of the province. The temples are numerous, the largest being that known as the Ching-hwang-miau; the most popular deities are the god of war and the goddess of mercy. The numerous shops are stocked with a profusion of goods of rather poor quality. They are quite open, and, with the full display of their contents, the jostling and noise of the hucksters, and the crowded state of the streets, give the thoroughfares much the appearance of a market place. One of the most singular features of Foochow is the great number of towers erected in all parts of the city, on the walls, over the streets, and even on the housetops, some of them covered with grotesque ornaments. The town has three principal hills within its walls, two in its southern and one in its northern quarter. A part of the E. and S. quarters of the city is inhabited by the Mantchoo Tartars, who number between 10,000 and 15,000 souls. They are of larger build and finer form than the Chinese, and their women do not compress their feet. The men professedly belong to the army, though the number receiving pay and rations does not exceed 1,000. The entrance to the river is marked by bold peaks and highlands. Foreign pilots take charge of vessels as far as the mouth, whence native pilots navigate them up to the pagoda anchorage, where the Chinese have an immense arsenal and dockyard, built in foreign style by officers of the

French navy. Above this place the water is too shallow for large vessels to proceed safely. The foreign settlement and consulates are about 3 m. from the city down the river. Foochow is a city of the first class (*foo*), and is the seat of a viceroy or governor general, whose jurisdiction extends over Fokien and Chekiang, its adjacent northern province; of a governor, a Tartar general of the same rank as the viceroy; of the provincial criminal judge, two district magistrates, the provincial treasurer, commissioner of the salt and provision department for the whole province, and the literary chancellor. A board of trade, consisting of three members, for the arrangement of affairs arising out of intercourse with foreigners, was established here after the treaty of Tientsin. Foochow is a great literary centre. Numerous gentry who have retired from office in other parts of the empire, and men of high literary attainments, reside here. There is a large provincial examination hall, which contains about 10,000 cells, where the literary graduates of the first degree who desire to compete assemble. The examinations take place twice every five years. There are several cotton, paper, and hardware manufactories, also several hundred furnaces for making porcelain, and factories of blue cloth, screens, combs, &c. There are lead mines near by, and a great tea-growing district lies within 70 m. The commerce of the city is chiefly with Japan and the maritime provinces of China. The principal exports are black teas, which can be purchased cheaper than at Canton, timber, bamboo, fruits, orange peel, tobacco, potash, spices, grain, copper, and lead. The imports are opium (sometimes to the value of \$5,000,000 per annum), salt, sugar, and European manufactures. The port is much frequented, the channel of the river and a sheet of water called Li-hu, or West lake, on the W. side of the city, being crowded with all kinds of vessels and floating habitations.

FOOD. See ALIMENT, CORPULENCE, and DIETETICS.

FOOL, or *Jester*, a character in mediæval courts and noble families, whose business it was to entertain the household by amusing sallies. Somewhat similar were the parasites of antiquity, who were wont to pay for their dinners by jests and flatteries. Court fools do not appear distinctly and officially till after the crusades. They were at first either misshapen, half-imbecile dwarfs, who were themselves ridiculous objects, and whose senseless replies were welcomed with laughter; or quick-witted, half-mad fellows; or poor and merry poets. Among the insignia of the office were the fool's cap, party-colored, adorned with three asses' ears and a cock's comb, and worn on a shorn head; the variously shaped fool's sceptre or bauble; the bells, which decorated the cap and most other parts of the costume; and a wide collar. Besides the ordinary fools, there was a more refined class, called merry counsellors, who had higher privileges and considerable

influence, but who are commonly confounded with the court fools proper. One of the most celebrated fools was Triboulet, a favorite of Francis I. of France, who amused his master often by giving him most impertinent counsels. He carried tablets on which he inscribed the names of courtiers who had committed any act of folly. His successor was Brusquet, who combined other offices with that of fool, who suffered much from the tricks of the courtiers whom he mystified, and whose bon-mots have been often repeated. Earlier French fools of renown were Caillette, Thony, Sibilot, Chicot, and the female Mathurine; and the annals of the office in France terminate with Angely, who was the titular fool of Louis XIII., and who became by his refined and cynical pleasantry one of the most formidable personages at court. Jodel der Narr, who was taken by the emperor Ferdinand II. to the diet in 1622, and Klaus Narr of Saxony, are famous among German fools. The office ceased in most European countries about the close of the 17th century, but continued longer in Russia, where Peter the Great often had twelve fools, whom he classified, and the empress Anne six, among whom were the Portuguese Da Costa and the Italian Pedrillo. In England the fools were long distinguished by a calf-skin coat, which had the buttons down the back. By the illuminators of the 18th century they are represented as squalid idiots, wrapped in a blanket, and holding a stick with an inflated bladder attached to it, which served as a bauble. From the 16th century they were often men of ability, and their entertainment consisted in witty retorts and sarcastic reflections. Though their license was extensive, they were liable to correction or discharge from office.—See Flögel's *Geschichte der Hofnarren* (Leipsic, 1789).

FOOLAHS, *Fulbe* (sing. *Pullo*), *Fellah*, or *Fellah*, a people of west and central Africa, comprising many tribes scattered along the Niger valley, between Timbuctoo and the kingdom of Dahomey, and Bondoo and Darfour. Originally they were nomadic, their chief occupation being cattle breeding; but about the middle of the 18th century, most of them becoming converts to Islamism, they began to found independent states, and to conquer the adjacent tribes. About 1802 one of their chiefs, called Othman or Danfodio, undertook to emulate the career of Mohammed, and laid the foundation of an empire at Sackatoo. He died in a sort of fanatical ecstasy in 1818. His successors a few years ago could bring into the field about 25,000 cavalry. Gando, about 40 m. from Sackatoo, is the seat of another powerful Foolah prince; and at Timbo, the capital of Fouta Jallon, resides a third. The aggregate area of these Foolah countries is estimated at over 800,000 sq. m.; the population at about 6,000,000. It is the opinion of modern travellers that the Foolahs are destined to become the dominant people of Negroland, and they have excited more interest and scientific

research than almost any other African race. In language, appearance, and history they present striking differences from the neighboring tribes, to whom they are superior in intelligence, but inferior, according to Barth, in physical development. Golbéry describes them as robust and courageous, of a reddish black color, with regular features, hair longer and less woolly than that of the common negroes, and high mental capacity. Lander, who saw them near Borgoo, says that they differ little in feature or color from the negroes; other travellers speak of them as having tawny complexions and soft hair. Dr. Barth found great local differences in their physical characteristics, and Bowen describes the Foolahs of Yoruba as being some black, some almost white, and many of a mulatto color varying from dark to very bright. Their features and skulls were cast in the European mould. They

Foolahs.

have a tradition that their ancestors were whites, and certain tribes call themselves white men. Some of them relate that they came from the country around Timbuctoo, and the prevailing opinion has been that their course of conquest was from central or east Africa westward; but Dr. Barth agrees with Clapperton in thinking that they made a second migration from the Senegal toward their birthplace, in the course of which they absorbed or conquered the tribes in their march. Their language is neither African nor Semitic. Foolahs are found in the suburbs of most of the towns of Soodan, pursuing the avocation of dairymen and cattle breeders. Most of them are Mohammedans. The usual dress of the men is a red cap with a white turban, a short white shirt, a large white robe, white trousers trimmed with red or green silk, and sandals or boots. The

women wear a striped garment falling as low as the ankles. The children of both sexes of the better classes are taught to read and write Arabic. The men wear swords at all times, and even go armed with bows and arrows on horseback. The sovereign of each Foolah state appoints governors of the provinces at pleasure, and on their death succeeds to all their effects. The Foolahs are in continual hostility with the Arabs.—See, besides the narratives of the travellers above mentioned, and the ethnological works of Prichard and Latham, *Histoire et origine des Poulhas ou Fellans*, by Gustave d'Eichthal (Paris, 1842).

FOOLS, Feast of, a mediæval grotesque religious ceremony, celebrated for several centuries, chiefly in France, at the festivals of the Nativity, the Circumcision, the Epiphany, the Murder of the Innocents, and especially at Christmas and Easter. The custom and amusements usually connected with the pagan Saturnalia had continued, in spite of prohibitions, to be observed among Christians both in the East and West, and gradually attached themselves to the Christian festivals occurring in December and January, which had been the months of the pagan celebrations. The *festum satutorum* or *foliorum* was a mixture of farce and piety, and a sportive travesty of the offices and rites of the church. The priests and clerks elected a pope, archbishop, or bishop, and conducted him in great pomp to the church, which they entered dancing, masked, disguised as women, animals, and merry-andrews; they sang infamous songs, converted the altar into a buffet, where they ate and drank during the celebration of the holy mysteries, played with cards and dice, burned old sandals instead of incense, ran about leaping, and amused the populace by indecent sallies and postures. The feast of fools was prohibited by the papal legate Peter of Capua in the diocese of Paris in 1198, and was condemned by the Sorbonne in 1444, but did not entirely disappear till toward the end of the 16th century. It was known in Germany only in the cities on the Rhine.

FOOT, a measure of length indicating its origin by its name, in general use in all civilized countries, and supposed to be adopted from the length of the human foot, possibly at first of some reigning sovereign. The length is very variable within moderate limits in different countries. The Roman *pes* has been calculated from several sources, as ancient measures, measurements of recorded distances along roads, and measurements of buildings of recorded dimensions. From the first source their foot appears to have been 0·9718 of the English foot, from the second 0·97082, and from the third 0·96994; the average of which would be 11·6502 inches. The Greek $\pi\omicron\tau\acute{\iota}\varsigma$ as used at Athens is believed to have been to the Roman foot as 25 is to 24, making it 12·135 English inches. The English standard, after a prolonged effort to recover the standard of 1760, which had been destroyed by fire, is now referred to the "straight line

or distance between the centres of the two gold plugs or pins in the bronze bar deposited in the office of the exchequer." This bar is designated as "bronze 19, No. 1," and the length is to be measured when its temperature is 62° F. This is declared to be the standard yard, and the standard foot is its third part. The twelfth part of the foot is the standard inch. The United States standard is a brass rule made for the coast survey by Troughton of London, from the old English standard. The following are a few of the principal feet, with their value in decimals of the English foot: The French old *pied du roy* equals 1·07, the modern *pied usuel*, 1·094; German, 0·971; Amsterdam old foot, 0·93, since 1820, if used, 1·094; Denmark Rhineland foot, 1·03; Hamburg, 0·94; Stockholm, 0·97; St. Petersburg, 1·145; Riga, 0·89; Canton, 1·05; Lisbon, 0·927, or according to others, 0·72; Turkey, 1·16; Constantinople, 1·23. As used by surveyors and engineers, the foot is decimally divided. Architects and artificers employ it with these divisions, and their scales are also made with inch divisions, and these subdivided into eighths and sixteenths of an inch.

FOOTA, a territory of Senegambia, west Africa, extending from the Senegal on the northwest to North Gangara on the southeast, between lat. 15° and 16° 26' N., and lon. 12° 36' and 16° 36' W.; area about 15,000 sq. m.; pop. estimated at 400,000. It is a fertile, well watered country, producing rice, gum, tamarinds, cotton, tobacco, and various kinds of grain. Large forests are spread over the surface, pasture lands support sheep and cattle, and there are several mines of iron. The inhabitants are mostly negroes, active and industrious, but, like most of their race, extravagantly superstitious. They profess Mohammedanism, and are firm believers in witchcraft. They cultivate the ground with considerable skill, and are active fishermen. Their manufactures are confined to cotton cloth and earthenware. The country is divided into three parts or provinces, viz.: Foota Tora on the north, Foota proper in the middle, and Foota Damga on the east. Each of these has its chief, subject to the *almamy* or sovereign, who is chosen from a few privileged families by a council of five. His authority is both secular and sacerdotal, but the council has the right of reprimanding, deposing, or in some cases putting him to death. The fanaticism of the people is a great impediment to European commerce, but in 1857 the French erected a fort at Podor, on the Senegal, for the protection of traders.

FOOTA JALLON, or *Futajallon*, a large territory of Senegambia, W. Africa, situated about the sources of the Gambia, Rio Grande or Jeba, and Joliba or Niger, and intersected by lat. 12° N. and lon. 18° W. It is mountainous and rocky, but about one third of it is extremely fertile, producing rice, maize, oranges, bananas, dates, honey, wax, wine, and oil, while large flocks of sheep pasture on the highlands. Iron

ore is wrought and manufactured into a very malleable species of metal. The inhabitants are Mohammedans of the Foolah race, remarkable for their fanatical hatred of all infidels except the whites, from whom they claim descent. Their houses are neat and well built; the principal towns contain manufactories of articles of dress, of iron, silver, wood, and leather. Trade is carried on with Timbuctoo and other places, and the merchants often make long commercial journeys. Timbo, the capital, is said to contain 7,000 inhabitants, and there are several other towns with a population of between 3,000 and 5,000. The government is elective.

FOOTE, Andrew Hull, an American naval officer, born in New Haven, Conn., Sept. 12, 1806, died in New York, June 26, 1863. He entered the navy in 1822 as acting midshipman, became passed midshipman in 1827, and lieutenant in 1830. In 1833 he was flag lieutenant of the Mediterranean squadron, and in 1838 circumnavigated the globe as first lieutenant of the sloop of war John Adams, participating in an attack on the pirates of Sumatra. While stationed at the naval asylum in 1841-'3 he prevailed upon many of the inmates to give up their spirit rations, and during the cruise in the Cumberland in 1843-'5 he not only induced the crew to forego the use of spirits, but personally superintended their religious instruction, delivering every Sunday an extemporaneous sermon. In 1849, in command of the brig Perry, he joined the squadron on the African coast, where during the next 2½ years he was actively engaged in suppressing the slave trade. After serving on the naval retiring board, he was appointed in 1856 to the command of the sloop Portsmouth, and ordered to proceed to the China station. Arriving at Canton just previous to the commencement of hostilities between the English and Chinese, he exerted himself in protecting the property of American citizens; and having been fired upon from the Canton barrier forts while in the discharge of this duty, he demanded an apology. This being refused, he attacked the forts, four in number, with the Portsmouth, supported by the Levant, breached the largest and strongest, and, landing with a force of 280 sailors and marines, carried the work by storm. The remaining forts were successively carried, with a total loss of 40 to the attacking party. The works were massive granite structures, mounting 176 guns and garrisoned by 5,000 men, of whom 400 were killed and wounded. At the commencement of the civil war in 1861, Commander Foote was executive officer at the Brooklyn navy yard. In July he was commissioned a captain, and in September was appointed flag officer of the flotilla fitting out in the western waters. He personally superintended the completion of this work, and on Feb. 4, 1862, sailed from Cairo with a fleet of seven gunboats, of which four were iron-clad, to attack Fort Henry on the Tennessee river. Without waiting for the

arrival of the land force under Gen. Grant, which was to coöperate with him, he opened fire upon the fort at noon of the 6th, and after an action of one hour compelled its surrender. Returning to Cairo, he sailed soon after for the Cumberland river, and on the 14th attacked Fort Donelson. The action was sustained with great vigor on both sides for an hour and a quarter, when the fleet was obliged to haul off, in consequence of two of the gunboats becoming unmanageable by having their steering apparatus shot away. Capt. Foote was severely wounded in the ankle, and his ship, the St. Louis, was struck 61 times. Though suffering from his wound, he proceeded down the Mississippi with his fleet, and commenced the siege of Island No. Ten. After the reduction of that place, he received leave of absence. Upon being restored to health, he was appointed chief of the bureau of equipment and recruiting. In July, 1862, he was appointed rear admiral, and in May, 1863, was ordered to take command of the South Atlantic squadron, but died while preparing to leave New York for Charleston. He was the author of "Africa and the American Flag" (1854), and a series of "Letters on Japan" (1857). His "Life" is announced as being in preparation by Prof. James Hoppin.

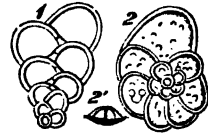
FOOTE, Henry Stuart, an American politician, born in Fauquier co., Va., Sept. 20, 1800. He graduated at Washington college, Lexington, Va., in 1819, was admitted to the bar in 1822, and in 1824 removed to Tusculum, Ala., where he edited a democratic newspaper. In 1826 he removed to Jackson, Miss. In 1847 he was elected to the United States senate, and was made chairman of the committee on foreign relations. In 1850 he took an active part in favor of the compromise measures, and in 1851, in a hotly contested election, was chosen governor of Mississippi, his competitor being Jefferson Davis. In 1854 he removed to California, but in 1858 returned to Mississippi, taking up his residence at Vicksburg. In the southern convention at Knoxville in 1859 he spoke warmly in opposition to disunion. During a great part of the civil war he was a member of the confederate congress from Tennessee, and distinguished himself by his personal and political hostility to Jefferson Davis. Not long after the close of the war he resumed the practice of law. He has been engaged in several duels, in two of which he was slightly wounded. He has published "Texas and the Texans" (Philadelphia, 1841) and "The War of the Rebellion, or Scylla and Charybdis" (New York, 1866).

FOOTE, Samuel, an English dramatist and actor, born in Truro, Cornwall, in 1720, died in Dover, Oct. 21, 1777. He was entered at Worcester college, Oxford, but his powers of mimicry involved him in indiscretions which led to the severance of his connection with the university when he was 20 years old. He soon afterward became a student at law in

the Temple, and, plunging into a career of pleasure, in less than four years dissipated at the gaming table and by reckless extravagance two fortunes which he had successively inherited from his uncle and his father. He thereupon became an actor, and in 1744 made his début at the Haymarket theatre in the character of Othello. He attracted little attention in tragedy or in comedy, and it was not until he brought the political and social notabilities of the day upon the stage by his wonderful gift of mimicry that he discovered his true road to success. In the spring of 1747 he opened the Haymarket theatre with a piece called "The Diversions of the Morning," written by himself, and in which he was the principal actor. The piece was successful almost beyond precedent. The licensing act having been applied against him by those whose foibles he had thus publicly portrayed, he made his piece a morning entertainment, and under the title of "Mr. Foote taking Tea with his Friends," it was repeated for more than 50 successive mornings. A similar piece, entitled "The Auction of Pictures," proved equally successful, and the author was complimented with the title of the English Aristophanes. He kept the Haymarket theatre open without a license for ten years (during which he found time to dissipate a third fortune), furnishing a constant supply of new plays to replace the old ones, and became the admiration of the town, and also its terror, as no person whose character possessed any vulnerable points was safe from his mimicry. In 1767 a fall from his horse occasioned the amputation of one of his legs; and the duke of York, who witnessed the accident, procured him a regular patent to open a theatre. He still wrote and acted, but less frequently than before; and in 1777, with a constitution undermined by ill health and mental suffering, he undertook a journey to France, and died on the way at Dover. He wrote about 25 plays, of which 20 have been published, and some others have been attributed to him. Those which have kept the stage longest are "The Minor," in which the Methodists are satirized, "The Englishman returned from Paris," "The Bankrupt," which attacks the newspapers, "The Orators," "The Lame Lover," "The Liar," and "The Mayor of Garratt." His dramatic works have never been published in a complete edition. William Cooke published his memoirs, and some of his writings (3 vols. 8vo, London, 1805).

FORAMINIFERA (Lat. *foramen*, an opening, and *ferre*, to carry), an order of the protozoa, of the class of rhizopoda, having the power of projecting and retracting through openings in their calcareous shell temporary thread-like prolongations (*pseudopodia*) of sarcode, or the gelatinous protoplasmic substance of which the body is composed; by these processes they move and obtain food; they differ from amœba in having a shell, and very long slender pseudo-

podia, interlacing with each other; they have no nucleus nor contractile vesicle, like the amœba. The shell is often very complex and beautiful, enclosing the sarcode body, which has no structure nor definite organs, and yet has the power of making a calcareous or sandy shell. The shell may be single or many-chambered, the latter produced by the budding of the former. Placed very near the bottom of the animal scale, structureless and without permanent organs,



1. *Textitarraria globulosa*.
2. *Rotalla globulosa*.
2'. Side view of *Rotalla Boucana*.

they yet perform all the great physiological functions of life, digestion, growth, reproduction, secretion, and locomotion. They are mostly microscopic, though the nummulite attained the diameter of an inch. They are all marine, and are distributed all over the world; they have been dredged from a depth of nearly three miles in the vicinity of Spitzbergen. They were among the earliest created animals, and the oldest known fossil, *amœbœn*, is a foraminifer; the great chalk deposit of Europe, wide as the continent, and sometimes nearly 1,000 ft. deep, is almost entirely made up of the foraminiferous *globigerina*, not to be distinguished from forms now living in the deepest Atlantic basin; the building stone of Paris is largely composed of foraminifera.

FORBACH, a town of Alsace-Lorraine, Germany, on the railroad near the frontier of Prussia, 11 m. N. W. of Saargemünd; pop. in 1871, 5,428. Near the town are the coal mines of Petite Rosselle, Urselsbach, Schönecke, and Stiring-Wendel, which annually yield about 50,000 tons. After the battle at the heights of Spichern (Aug. 6, 1870), in which Gen. Frossard was defeated by several divisions of the armies commanded by Gen. Steinmetz and Prince Frederick Charles, and which is called by the French the battle of Forbach, the town was occupied by the German troops, and was afterward annexed to Germany with the rest of Lorraine. It was previously the capital of a canton in the French department of Moselle.

FORBES, Archibald. See supplement.

FORBES, Duncan, a Scottish statesman, born at Buchrew, near Inverness, Nov. 10, 1685, died Dec. 10, 1747. He was educated at Inverness and Edinburgh, and at the university of Leyden, and in 1709 became an advocate. He had already won the friendship of John, duke of Argyll; and in 1715 he took an active part in suppressing the rebellion. He was appointed to aid in prosecuting the captured rebels, but it does not appear that he acted in the office, and he was prominent in aiding the Scotch prisoners in England. In 1716 he was appointed advocate depute, in 1722 was returned to the British house of commons for Inverness, and in 1725 became lord advocate. The office of secretary of state for Scotland being at this

time discontinued, its duties devolved on the lord advocate, who was thus temporarily at the head of the government. The office of lord president of the court of session was conferred on him in 1737. He still paid regard to political affairs, and proposed that government should raise several regiments of highlanders, to be officered by the chiefs of the disaffected clans, and employed in the threatened Spanish war. Several leading men, including Walpole, approved the plan, but nothing was done. When the second rebellion broke out, in 1745, he exerted himself strenuously to prevent its spread, withheld several highland chiefs from joining the pretender, and was more efficient than any other man in restraining the rebels. After the battle of Culloden, which took its name from Forbes's family estate, he sought to moderate the ferocity of the victors, but his remonstrances were treated with the utmost scorn and contempt. He was insulted by Cumberland, who called him "that old woman who talked to me about humanity." The government used him with baseness. He had advanced and borrowed large sums of money in aid of it, but none of his advances were returned, and the borrowed money was repaid from his estate, after his death, by his son. Forbes saw the changes that were forced upon Scotland after the rebellion with regret, and his death, which happened 20 months after the battle of Culloden, is supposed to have been caused by the humiliation of himself and his country. He was a Hebrew scholar, and wrote "Thoughts on Religion, Natural and Revealed," "Reflections on the Sources of Incredulity in regard to Religion," and "A Letter to a Bishop concerning some important Discoveries in Philosophy and Religion." His correspondence in relation to Scottish affairs was published under the title of "The Culloden Papers" (London, 1815); and his biography has been written by John Hill Burton (London, 1847).

FORBES, Edward, an English naturalist, born in Douglas, Isle of Man, early in 1815, died at Wardie, near Edinburgh, Nov. 18, 1854. In his 17th year he went to London with some idea of becoming a painter, and acquired a facility in drawing which afterward proved of great assistance in his scientific explorations. In 1831 he went to Edinburgh, where he studied medicine, but devoted himself especially to investigations in natural history, and never took the degree of M. D. Dredging in the waters for specimens of submarine zoölogy, which at the commencement of his studies was a comparatively new occupation to naturalists, became under his hands the means of opening a new field of research; and the results of his labors, published in the "Magazine of Natural History," under the title of "Records of the Results of Dredging," were among his earliest contributions to scientific literature. In his 18th year he made a summer excursion to Norway, bringing back abundant specimens of its rocks, plants, and mollusca. He remained con-

nected with the university of Edinburgh till 1839, varying his residence there by excursions to southern Europe, the Mediterranean, and Algeria. The greater part of 1837 he passed in Paris studying geology, mineralogy, and zoölogy, and working in the museum and collections of the *jardin des plantes*. During this period he published also papers on the "Mollusca of the Isle of Man," the "Land and Fresh-Water Mollusca of Algiers," on the "Distribution of the Pulmonifera of Europe," &c. In 1841 he published his "History of British Star Fishes," with 120 illustrations. In the spring of 1841 he went as naturalist on the surveying ship *Beacon*, destined for the coast of Asia Minor, where she was to receive the Xanthian marbles, the existence of which had recently been made known by the explorations of Sir Charles Fellows. During the 18 months that Mr. Forbes remained on board the vessel he established by dredging operations in various depths of water the fact that the distribution of marine life, like that of terrestrial animals and vegetables, is determined by certain fixed laws, and that the zones which the different species inhabit are as distinctly marked in the one case by the climate and the depth and composition of the water, as in the other by temperature, altitude, and other influences. The results of these researches were given in a paper entitled "Report on the Mollusca and Radiata of the Ægean Sea, and on their Distribution, considered as bearing on Geology," which was read before the meeting of the British association in Cork in 1843. He also assisted in the excavations of the cities on the Lycian Xanthus, the ruins of 20 of which he was instrumental in discovering. In 1846 he published, in conjunction with Lieut. Spratt, "Travels in Lycia, Milyas, and the Cibyria." In the latter part of 1842 he was recalled to England by his appointment as professor of botany in King's college, London, and was soon afterward appointed curator of the museum of the geological society, and palæontologist of the new museum of practical geology, established in connection with the ordnance geological survey. He subsequently became professor of natural history at this institution. Among the first fruits of his labors was a treatise "On the Connection between the Distribution of the Existing Fauna and Flora of the British Isles, and the Geological Changes which have affected their Area" (1846), in which the conclusions arrived at, after investigations in an unusually wide field of speculative research, are that the fauna and flora of Britain, both terrestrial and marine, are members of families inhabiting a contiguous continent, which at no very remote period existed in the Atlantic, whence they migrated before, during, or after the glacial epoch. Of papers on zoölogy and geology he prepared previous to 1850 upward of 89, exclusive of his botanical papers or those published after that date, which are numerous; and his note books and collections contained

the materials for many more. One of the most important works in which he took part after his connection with the geological society was the preparation of the palæontological and geological map of the British isles, to which he appended an explanatory dissertation and a map of the "Distribution of Marine Life." In 1852 he was elected president of the geological society, and in the succeeding year obtained the professorship of natural history in the university of Edinburgh. He delivered a course of lectures in Edinburgh in the summer of 1854, but was soon after attacked by a disease of the kidneys, which ultimately proved fatal. In addition to the works enumerated, Prof. Forbes assisted Mr. Hanley in the preparation of the "History of British Mollusca" (4 vols. 8vo, 1853), the descriptions in which were written by himself, and contributed important information respecting the distribution of plants and animals to a revised edition of Johnston's "Physical Atlas." He also possessed a considerable knowledge of general literature, which in the intervals of his scientific labors he assiduously cultivated; and after his death his friends were surprised to learn that for a number of years he had been a regular contributor of miscellaneous articles to the columns of the London "Athenæum" and "Literary Gazette," a collection of which was published under the title of "Literary Papers by the late Edward Forbes," with a Memoir by Huxley (12mo, 1855). His other posthumous publications are: "Zoology of the Voyage of H. M. Ship Herald" (8 vols. 4to), and "Mollusca and Radiata of the Voyage of H. M. Ship Herald," the latter written in conjunction with Prof. Huxley.

FORBES, James David, a Scottish physicist, born in Edinburgh, April 20, 1809, died at Clifton, Eng., Dec. 31, 1868. He was educated at the university of Edinburgh, and at the age of 17 he began a correspondence on scientific matters with Dr. (afterward Sir David) Brewster, which continued for some years, and Forbes's papers were published in Brewster's "Journal." In the summer of 1826 he visited the continent; he ascended Vesuvius, publishing his observations, and during this tour made his first visit to Chamouni. In June, 1830, he passed as an advocate, but immediately abandoned the bar to devote himself to scientific pursuits. In the ensuing winter he became a member of the royal society of Edinburgh. In September, 1831, he assisted in founding the British association. In January, 1833, at the age of 24, he was elected professor of natural philosophy in the university of Edinburgh, and entered upon the duties in November following. In 1837 he was appointed dean of the faculty of arts. His summer vacations were devoted to travel. He passed the summers of 1837 and 1838 in an extended tour through north Germany and Austria; from May to August, 1839, he was in the south of France, and was more or less

among the Alps; and in July, 1841, in company with Prof. Agassiz, he ascended the Jungfrau. His first Alpine experiences appeared in an article on glaciers in the "Edinburgh Review," April, 1842, though the year before he had published in the proceedings of the royal society his views on the peculiar structure of the ice in glaciers, and in August, 1840, he had crossed the southern spurs of Monte Rosa from valley to valley, exploring the glaciers as he went. In September, 1842, he was again at Chamouni, and numerous geological excursions to Vesuvius in the vicinity of Naples occupied him till the end of the year. In 1843 he published "Travels through the Alps of Savoy," and in April of that year he visited Mt. Etna. The summers of 1844 and 1846 he devoted to the measurement of the rate of motion in the Swiss glaciers. In the summer of 1845 he made a tour of the western highlands, explored Coolin mountain in the isle of Skye, in company with M. Necker, and found indisputable traces of glaciers. In September of that year Sir Robert Peel conferred upon him a government pension of £200 a year. He passed his vacation in 1850 at Chamouni, not specially occupied with glacier observations, but correcting and extending his survey. He crossed from the Glacier du Tour, descending into the Swiss Val Ferret by the Glacier de Salena, making the most interesting, most difficult, and last of his expeditions among the higher glaciers of the Alps. His survey of the Mer de Glace was the last of his Alpine work. His last scientific journey was in June, 1851, to Bergen, Norway, to observe an eclipse of the sun visible only in northern latitudes; and on his way to Christiania he visited the glaciers of the Hardangerfield. In 1853 he published "Norway and its Glaciers," and in 1855 "Tour of Mont Blanc and Monte Rosa." In December, 1859, he succeeded Sir David Brewster as principal of the United college in St. Andrews, and in April following he resigned his chair at Edinburgh. His health had been failing since 1852, and he resigned his principalship in October, 1868, two months before his death. He had received the degree of D. C. L. from Oxford university in 1855. Besides the works above enumerated, Dr. Forbes printed from 1827 to 1867 in the "Edinburgh Journal of Science" the proceedings of the royal society of Edinburgh and of the British association, the "Edinburgh New Philosophical Journal," and other publications, more than 100 important scientific papers on geology, meteorology, electricity, magnetism, refraction and polarization of heat, volcanic formations, temperature and conducting powers of different strata, excessive rainfall, and many other subjects. Among his original contributions to physical science is the polarization of radiant heat, which he confirmed by a variety of ingenious experiments. Besides his works on the Alps and Norway, he published 15 letters

and several papers on glaciers. He claimed the discovery of the real structure of glacier ice; the treatment of glacier motion as a problem of mechanical forces and its examination as such; and, generally, the first attempt to explain the leading phenomena of glaciers. These claims involved him in a controversy with Prof. Tyndall and others.—See his "Life and Letters," by Shairp, Tait, and Adams-Reilly (London, 1873).

FORBES, Sir John, a British physician and writer on medical science, born at Cuttlebrae, Banffshire, Scotland, in 1787, died in London, Nov. 13, 1861. He was educated at Marischal college, Aberdeen, served in the medical department of the navy, practised his profession at Penzance and Chichester, and finally removed to London. In 1824 he published translations of the works of Auenbrugger and Laennec on auscultation, following them up by an original work of his own on the subject. He was instrumental in founding the British medical association, to the "Transactions" of which he contributed a paper on the "Medical Topography of the Hundred of Penrith." He was also the chief editor of the "Cyclopædia of Practical Medicine," and for 12 years conducted the "British and Foreign Medical Review," retiring in 1848. He wrote "Observations on the Climate of Penzance and Land's End" (1828); "A Manual of Select Medical Bibliography" (1835); "Illustrations of Modern Mesmerism" (1846); "Treatise on Diseases of the Chest," and "Nature and Art in the Cure of Disease" (1857); "A Physician's Holiday, or a Month in Switzerland during the year 1848" (1849); "Memoranda made in Ireland in 1852" (1852); and "Sight-seeing in Germany," &c. (1855). He was physician in ordinary to the household of the queen, by whom he was knighted in 1853.

FORCADE, Eugène, a French author, born in Marseilles in 1820, died at Billancourt, near Paris, Nov. 8, 1869. He founded in 1837 the *Sémaphore*, the principal newspaper at Marseilles, and edited it till 1840. In that year he went to Paris, and subsequently became the political editor of the *Revue des Deux Mondes*. Overwork brought on insanity, the first symptoms appearing in 1868, while he was attending the funeral of Manin at Venice, and he never fully recovered his reason. He published *Études historiques* (1853), and *Histoire des causes de la guerre d'Orient* (1854).

FORCE, Peter, an American journalist and historian, born at Passaic Falls, N. J., Nov. 26, 1790, died in Washington, Jan. 23, 1868. He removed to New York when a child, became a printer, and in November, 1815, removed to Washington. In 1820 he began the publication of the "National Calendar," an annual volume of national statistics, which he continued till 1836. From Nov. 12, 1823, to Feb. 2, 1830, he published the "National Journal," a political newspaper, which was the official journal during the administration of John

Quincy Adams. From 1836 to 1840 he was mayor of Washington, and was afterward president of the national institute for the promotion of science. In 1833 he made a contract with the government for the preparation and publication of a documentary history of the American colonies, of which nine folio volumes were published, under the title of "American Archives." This work occupied Mr. Force for 30 years, and in its prosecution he gathered a large and valuable collection of books, manuscripts, maps, and papers relating to American history. In 1867 this collection was purchased by the government for \$100,000, and was transferred to the library of congress. He also published four volumes of historical tracts, relating chiefly to the origin and settlement of the American colonies; "Grinnell Land" (8vo, Washington, 1852); and "Record of Auroral Phenomena" (4to, Washington, 1856).

FORCELLINI, Egidio, an Italian lexicographer, born near Padua, Aug. 26, 1688, died April 4, 1768. Admitted into the seminary of Padua, his progress in the ancient languages induced his master Facciolato to make him his assistant. In 1718 they conceived the project of publishing a universal dictionary of the Latin language; but Forcellini being sent in 1724 to Ceneda as professor of rhetoric and director of the seminary, the execution of the task was suspended till his return in 1731. This great work was almost wholly executed by Forcellini, and for it he read with pen in hand not only the whole Latin literature, but all the collections of inscriptions and medals. He died before the work appeared in 1771, under the title of *Totius Latinitatis Lexicon, consilio et cura Jacobi Facciolati, opera et studio Egidii Forcellini lucubratum*.

FORCHHAMMER, Johann Georg, a Danish geologist and chemist, born at Husum, Schleswig, July 26, 1794, died in Copenhagen, Dec. 18, 1865. He became secretary of Oersted, accompanied him on a mineralogical expedition to the island of Bornholm (1818-'19), and subsequently made several journeys in Great Britain, France, and Denmark at the expense of the Danish government. He was professor of geology at Copenhagen, and in 1851 succeeded Oersted as secretary of the academy of sciences. His principal works are *Danmarks geognostiske Forhold* (1835), and *Skandinaviens geognostiske Natur* (1848). He also excelled as a lecturer on chemistry and mineralogy, and wrote a manual of universal chemistry (*Lærebog i Stoffernes almindelige Chemie*, 1834-'5).

FORCIBLE ENTRY. In law, the phrase forcible entry and detainer means the unlawful and violent entry upon and taking possession or keeping of lands or tenements, with actual or threatened force or violence. In nearly all, and indeed, in some form, in all our states, there are laws respecting this, which are usually very stringent. 1. It is regarded generally as an offence and made indictable, or

treated as being so at common law. 2. An action is given for damages, or remedial process provided, by means of which the party entitled to possession may have it with the least delay compatible with sufficient inquiry into questions of right and title. The entry and detainer are usually spoken of together; but it seems to be settled that they are distinct offences. The Roman civil law, in its anxiety to preserve the peace of the community, made it a punishable offence even in an owner of an estate to take forcible and violent possession of it.

FORD. I. A N. E. county of Illinois, drained by the middle fork of Vermilion river; area, 450 sq. m.; pop. in 1870, 9,103. The surface is level and the soil fertile. The Chicago branch of the Illinois Central, and the Toledo, Peoria, and Warsaw railroad pass through it. The chief productions in 1870 were 43,579 bushels of wheat, 565,671 of Indian corn, 154,589 of oats, 39,636 of potatoes, 23,446 tons of hay, and 262,646 lbs. of butter. There were 4,839 horses, 8,069 milch cows, 6,000 other cattle, and 9,621 swine. Capital, Paxton. II. A S. W. county of Kansas, intersected by the Arkansas river; area, 900 sq. m.; pop. in 1870, 427.

FORD, John, an English dramatist, born at Ilington, Devonshire, April 17, 1586, died there about 1640. At the age of 16 he was entered a student of law in the Middle Temple, and having been regularly called to the bar, practised law until 1638 or 1639, when he is supposed to have retired to his native place, as all trace of him ceases after this date. After his professional labors had secured him an independent position, he became indifferent to the pecuniary profit of his plays, but finished them carefully, making little effort to court the popular taste. He is said to have assisted Webster in "A late Murder of the Sonne upon the Mother," a play which has been lost, and Decker in "The Fairy Knight" and "The Bristowe Merchant," which have likewise disappeared. He joined with Decker in writing "The Sun's Darling," a moral masque acted in 1623-'4, and published in 1657; and of "The Witch of Edmonton," written in conjunction with Rowley and Decker, the last act is ascribed to Ford. His own plays are: "The Lover's Melancholy" (1629); "Tis Pity she's a Whore," "The Broken Heart," and "Love's Sacrifice" (1633); "Perkin Warbeck" (1634); "The Fancies Chaste and Noble" (1638); and "The Ladie's Trial" (1639). He was entirely destitute of comic ability. "The Broken Heart" and "Perkin Warbeck" are commonly esteemed his finest plays. His complete dramatic works were first published in 1811, in 2 vols., edited by H. Weber. In 1827 appeared Gifford's edition in 2 vols. 8vo, and in 1847 an expurgated one in Murray's "Family Library." The most recent edition is that published in Moxon's series of the old English dramatists.

FORD, Richard, an English author and traveller, born in London in 1796, died at Heavitree, near Exeter, Sept. 1, 1858. He was educated at Winchester and at Trinity college, Cambridge, and was called to the bar at Lincoln's Inn, but never practiced. In 1830 he visited Spain, where he spent several years in the study of the country and the people. From 1836 to 1857 he was a regular contributor to the "Quarterly Review," in which his articles on the life, literature, and art of Spain attracted much attention. He was the author of Murray's "Handbook for Spain," first published in 1845, and rewritten and enlarged in 1855. His remaining publications are "Gatherings in Spain" (1848), and "Tauromachia, the Bull Fights of Spain, with 26 illustrations" (1852). His collection of books, prints, and pictures was one of the choicest in England.

FORDHAM, formerly a village in the town of West Farms, Westchester co., New York, but since Jan. 1, 1874, included in the 24th ward of New York city, situated on the New York and Harlem railroad, about 12 m. N. of the city hall and 2 m. from the Hudson river; pop. in 1870, 2,151. It is the seat of several Roman Catholic institutions, of which the most prominent is St. John's college, standing on a slight eminence, surrounded by magnificent grounds. It was founded by the Rev. John Hughes, first archbishop of New York, and was opened for students June 24, 1841, most of the professors being secular clergymen, and the Rev. John McCloskey, now archbishop of New York, first president. The college was chartered as a university in 1846; the first commencement for conferring degrees was held in July of the same year, and immediately afterward the place was transferred to the Jesuits, who broke up their establishment at Bardstown, Ky., and took charge of the institution at Fordham in September, 1846. The college buildings, 9 or 10 in number, cover about an acre, and the play grounds, lawn, &c., embrace about 20 acres. Immediately adjoining are the college farm and garden, embracing about 80 acres. The college library contains over 20,000 volumes, besides which the students have the use of two other libraries, containing about 4,000 volumes. There are valuable chemical and philosophical apparatus, and a geological and mineralogical cabinet, with about 2,500 specimens. The college combines the ordinary features of preparatory, grammar, and commercial schools with those of a university. In the commercial course the degree of bachelor of science is conferred. There are also several supplementary classes. Students are received at any age. The younger students are kept apart from the elder; the three divisions into which the pupils are separated, according to age and proficiency, are allowed to have no communication with one another, each having its separate gymnasium and play grounds. In the senior class Latin is altogether spoken in

the lectures and recitations. During the scholastic year 1872-'8 there were 18 professors and tutors, of whom 3 were not Jesuits; 10 other officers, of whom 2 were not Jesuits; and 267 students. The whole number of graduates is 300. The college year is divided into two terms, the first beginning on the first Wednesday in September and ending Jan. 31, and the second beginning Feb. 1 and ending on the last Wednesday in June. There are two vacations, from Dec. 21 to Jan. 3, and from the last Wednesday in June to the first Wednesday in September. St. Joseph's academy for young ladies in 1872 had 4 instructors and 21 pupils. There is also an asylum for female deaf mutes. St. Joseph's theological seminary, formerly established here, has been removed to Troy. The village is a favorite summer residence.—In October, 1776, immediately after the evacuation of New York by the British troops, the American army occupied a series of intrenched camps on the hills from Fordham heights to White Plains. Several pieces of cannon have been dug up here, and the remains of earthworks and other fortifications are still seen in the vicinity.

FORDYCE, David, a Scottish philosopher, born in Aberdeen in 1711, died in 1751. He was educated for the church at the university of his native city, where in 1743 he became professor of moral philosophy. He afterward travelled through France, Italy, and other countries of Europe, but was lost in a storm off the coast of Holland. His most important works are: "Dialogues concerning Education" (2 vols. 8vo, London, 1745-'8); "Theodorus, a Dialogue concerning the Art of Preaching" (12mo, 1752); and "Elements of Moral Philosophy" (12mo, 1754).

FORECLOSURE. See **MORTGAGE**.

FOREST, a N. W. county of Pennsylvania; area, 376 sq. m.; pop. in 1870, 4,010. The Clarion river runs along the S. E. border, and the Alleghany intersects the N. W. part. The surface is hilly and irregular. Some of the land is too rocky for cultivation. The chief articles of export are pine timber and hard coal, the former of which is very abundant. The chief productions in 1870 were 5,802 bushels of rye, 17,588 of Indian corn, 38,465 of oats, 6,946 of buckwheat, 15,260 of potatoes, and 2,665 tons of hay. There were 2 flour and 18 saw mills. Capital, Marionville.

FOREST GROVE, a post village of Washington co., Oregon, on the Oregon Central railroad, 23 m. W. of Portland; pop. in 1870, 922. It is the seat of Pacific university, which has preparatory, normal, scientific, and collegiate courses, and a three years' course for young ladies. It was organized in 1859, and in 1872 had 7 professors and instructors, 160 students, and a library of 5,000 volumes.

FORESTI, E. Felice, an Italian patriot, born at Conselice, near Ferrara, about 1793, died in Genoa, Sept. 14, 1858. He took the degree of doctor of laws at the university of Bologna,

and practised as a criminal lawyer before the tribunals of Ferrara. In 1816 he was appointed prætor of Crespino in the Austrian dominions. He entered into a conspiracy to deliver Italy from Austrian rule; but this being betrayed by an associate, Foresti and several others were arrested and thrown into prison in Venice in 1819. After two years' confinement they were brought to trial and condemned to death, but the sentence was commuted to 20 years' imprisonment. They were kept until January, 1822, on the island of St. Michael, when they were taken to the fortress of Spielberg in Moravia. The hardships which they here endured have been narrated by Silvio Pellico in *Le mie prigioni*. In 1835 their punishment was commuted by the emperor Ferdinand to perpetual exile in America. They landed at New York near the end of October, 1836, where Foresti soon became a favorite in society, was appointed professor of the Italian language and literature in Columbia college, and for more than 20 years was a popular teacher in academies and private circles. For the use of his pupils he published a *Crestomasia italiana* (12mo, New York, 1847). In 1848 he went to Europe, but returned in 1849. Failing health having impelled him to seek a milder climate, he sailed for Genoa, where he was appointed United States consul, in the spring of 1858.

FOREY, Élie Frédéric, a French soldier, born in Paris, Jan. 10, 1804, died in Besançon, June 20, 1872. He was a graduate of the military school at St. Cyr, and accompanied the first expedition to Algeria, whence he returned in 1844 with the rank of colonel. He became general in 1848, in 1851 commander of the legion of honor in reward for his reckless firing on the opponents of the *coup d'état*, and in 1852 he was made general of division. In 1854 he commanded for a short time before Sebastopol. In the Italian war of 1859 he was the first to inflict a heavy blow upon the Austrians, at Montebello. He distinguished himself also in other engagements, especially at Solferino, after which he was made a senator. In 1862 he served in Mexico at first under Bazaine, and was afterward invested with the civil and military administration as minister plenipotentiary. He confiscated the property of Mexicans hostile to the invasion, compelled the surrender of Puebla, May 17, 1863, entered the city of Mexico, June 10, and was appointed marshal. In the autumn he was recalled to France, owing to his dictatorial and ambitious disposition, and in December became commander of the second army corps. In 1867 he directed the exercises in the camp of Châlons, and then retired on account of ill health.

FORFAR, a royal and parliamentary burgh of Scotland, capital of Forfarshire, situated in the valley of Strathmore, near a small loch of the same name, 13 m. N. by E. of Dundee; pop. of the town in 1871, 11,036. It consists of two principal streets, with well built sub-

stantial houses. Among its public buildings are a handsome county hall, a court house, a library and reading room, and a mechanics' institute. Its staple manufacture is linen, chiefly sheetings, osnaburgs, and dowlas. Shoes called brogues are also made largely for export. Forfar is connected by railway with Aberdeen, Arbroath, and the south. It has been a royal burgh since the reign of David I., and its castle, destroyed by Robert Bruce in 1307, was once a royal residence.

FORFARSHIRE, or *Angus*, an E. county of Scotland, on the coast of the North sea, and bordering on the counties of Kincardine, Aberdeen, and Perth, with the frith of Tay on the south; area, 875 sq. m.; pop. in 1871, 237,587. It has about 45 m. of coast. The surface is irregular and intersected by hills, the Benchennin, a part of the Grampians, in the N. W., and S. of and parallel to them the Sidlaw. The valley of Strathmore, which lies between these ranges, is celebrated for its beauty and fertility; and the part bordering on the sea is level, fruitful, and highly cultivated. The principal rivers are the Tay, N. Esk, S. Esk, and Isla. Agriculture is in a very advanced state. Wheat, oats, barley, potatoes, and turnips are raised largely; and sheep and cattle are bred to some extent. There are valuable deep-sea, herring, and salmon fisheries along the coast and in the rivers. The principal minerals are limestone and slate. Forfarshire is the seat of the coarse linen manufactures of Scotland. Its chief towns are Forfar, the capital, and Dundee, Montrose, Arbroath, and Brechin.

FORFEITURE, in law, the loss of property as a consequence of some act which the law forbids and attaches this penalty to, or which the party has agreed not to do under the same penalty. Forfeiture is defined by Blackstone as a punishment which the law inflicts. It is so undoubtedly in all cases of forfeiture by crime; but we apprehend that it can be called punishment in the ordinary cases of civil forfeiture only as all consequences of wrong doing may be called punishment. Forfeiture was annexed by the law of England to many offences, as treason, felony, misprision of treason, *præmunire*, drawing a weapon upon a judge, or striking any person in the presence of any of the king's courts of justice. Lands and hereditaments were forfeited only upon attainder or corruption of blood; but forfeiture of goods and chattels took place upon conviction. Attainder, and the consequent forfeiture, were the most powerful instruments by which the greatest tyrants among the English monarchs endeavored to confirm and increase their power. Our fathers held them in so much dread and detestation, that the constitution of the United States (art. iii., sec. 3) declares that no attainder of treason shall work corruption of blood or forfeiture, except during the life of the person attainted; and now in England, by statute 3 and 4 William IV., c.

108, forfeiture for crime, where it exists at all, is only for the life of the person attainted.—Civil forfeiture may occur in three ways: 1. By operation of law, the principal instance of which at common law was the forfeiture of estates which were less than a fee, which was incurred when the holder made a conveyance of a greater estate than he held; as for example, if a tenant of land for life or years conveyed the land in fee, the grantee took nothing, but the whole estate of the grantor was forfeited to the remainderman, or reversioner. In the United States, however, a more just and rational rule prevails. With some diversity in its details, it may be generally expressed thus: A grant of more than the grantor has operates as a grant of all he has, and as to all that is more it is void. 2. When certain conditions are annexed to an estate, either in the deed or devise or otherwise, at the original creation, the penalty of forfeiture may be annexed to those conditions, and will take effect if they be broken; as if A grants to B land, on condition that neither he nor any one claiming by or through him shall put up a certain building, or any building within a certain distance of one of the boundaries, or any other thing of like kind, then if anything is done which violates the condition, the land is forfeited. It may be remarked, however, that the law does not favor conditions of this kind; and courts would construe them, where it could properly be done, either as giving a right to the grantor to abate and remove whatever thus violates the agreement, or as an injury for which compensation may be had in damages, leaving, in both cases, the estate undisturbed. 3. One may agree to pay a certain sum in case a less sum be not paid, or some other certain thing be not done, at a certain time. This is usually done by a bond; and the sum thus agreed to be paid is a penalty, which the courts of England and of the United States will reduce to the amount actually due. So one who becomes surety for another in a certain sum that this other shall appear at a certain time, forfeits the sum if that other does not appear. But on good cause being shown, courts have the power, and are usually willing to exercise it, to mitigate the penalty, and remit the forfeiture in whole or in part.

FORCE, a manufactory in which iron or steel is softened by heat and worked under the hammer. The term is also applied to works in which the native oxides of iron are reduced without fusion to a metallic state, and then forged into blooms or bars. Several forms of these are noticed in the article **BLOOMERY**. Forges differ from founderies and blast furnaces in their products being articles of wrought iron, while those of the latter are castings. The works in which the pig iron, obtained from the blast furnaces, is converted into malleable iron by the process termed puddling (see **IRON**), are commonly called puddling furnaces from one department of the operation; but

they are also called forges from the hammering or rolling which succeeds the reduction process in the furnace. The term forging is equally applicable to the working of other malleable metals, as gold, silver, and copper, when these are heated and hammered into desired shapes.—The immense variety of articles into which iron is fashioned requires forges of various dimensions, and many of them adapted for special uses. They agree, however, in the general character of the apparatus with which they are furnished. The smith's forge, fitted for all sorts of small work, is the best representative of the smaller forges. It is provided, first, with a small open fireplace or hearth, upon a sort of table in brickwork, 2 to 2½ ft. high. A chimney, open at the base, stands at one end, and a hood of sheet iron prevents the escape into the room of the vapors from the fire. Two fires are sometimes arranged under the same hood, and a double hearth is again obtained by building two hearths back to back, the same chimney having a flue for each fire. In the back wall of each hearth is fitted a cast-iron plate or back through which the perforated nozzle of the tuyere, or piece forming the extremity of the blast pipe, projects into the fire. The pipe connects with the bellows, which is so placed that the smith can work it with one hand, as he attends to the fire upon the hearth and the articles heating in it with the other. The fuel may be charcoal, bituminous coal, coke, or anthracite. Good hard-wood charcoal is an excellent material, not only for its great calorific property, but more particularly for its freedom from sulphur, the presence of which in the mineral fuels often results in serious detriment to the iron exposed to its action. Upon the hearth are laid the various kinds of tongs required for holding the differently shaped pieces of iron. At the end opposite the chimney is a trough for water, into which the tools and work are dipped, as may be convenient, to cool them. It serves also, if kept scrupulously free from grease, for tempering articles of steel; and the water is also frequently sprinkled with a broom dipped in it over the fire, to check the combustion of the fuel at the surface. A stock of fuel is kept on the hearth by the trough, and as wanted it is drawn forward upon the fire. Conveniently near the hearth, and at the same height, is set the anvil, upon which the smith places the heated iron as he takes it from the fire. As the smith holds the hot iron upon the anvil with his left hand, he hammers it with the right, directing his blows and turning the work to receive the precise effect in a manner to be acquired only by long practice. If the work is heavy, he requires an assistant to aid the forging by striking with a heavy sledge, while he turns the piece to receive the blows, and strikes himself in turn with his hand hammer, tapping it at last upon the face of the anvil as the signal, universally adopted, for the blows to cease. Hammers are

employed of a great variety of shapes and sizes adapted to the different kinds of work. There are also punches for driving holes through the soft iron, chisels of numerous shapes, and swaging tools, which are generally in pairs, and called top and bottom tools, the latter fitting by a tang into a hole in the anvil.—The great forges in which are fabricated the immense wrought-iron shafts for ocean steamers present the same class of operations, with some new appliances, however, adapted to the gigantic scale upon which the work is done. The fires in these forges are either large reverberatories or close furnaces, blown by a powerful fan blast. The work is commenced by introducing 15 to 20 pieces of square iron bound together, making, it may be, a bundle 6 ft. long and 2 ft. square, into the furnace. When one end is brought to a welding heat the mass is swung out suspended in chains from the great crane and subjected to the blows of a heavy hammer, of 5 or 10 tons weight, moved by its own gravity, or a lighter hammer is used, moved by steam. One long rod is left projecting on the line of the axis of the mass, and serves when swung in the crane as a guide rod, or porter, as it is called. By means of the pulleys which sustain the load running forward and back upon the jib of the crane, the mass is brought to any desired point within the area traversed by the swing of the crane; and by means of a cross lever or handle fixed to the end of the porter the men are enabled to turn the mass of iron while the other end of it is receiving upon the anvil the blows of the hammer. When the iron has been sufficiently hammered, it is returned to the furnace to be again heated, so as to extend the weld throughout the whole mass. After this a slab of wrought iron, called by the workmen a use, is welded on one side at the end of the piece, and under the hammer the shaft thus built up is drawn down to the required size. New additions are repeatedly made in this way until the desired length is obtained. Only the end of the shaft is thrust into the furnace, and the aperture which remains open around it is stopped during the heating by fire brick and clay. The end outside remains supported in the chains from the crane. The weight of the intermediate paddle shaft of the Great Eastern, which was launched at the end of January, 1858, is upward of 22 tons, and that of the cranks 11 tons. Its length is 23 ft., and its diameter 2 ft. 2 in., and it is 2 ft. in diameter at the main bearings. The cranks are 7 ft. long between the centres. The screw shaft is 2 ft. in diameter and about 178 ft. long, and its whole weight about 185 tons.

FORGERY, in general, the illegal falsification or counterfeiting of a writing. Although this offence is the subject of a great variety of cases in England and the United States, the definitions do not quite agree. That given in East's "Pleas of the Crown" (vol. ii., p. 852) is: "A false making of any written instrument

for the purpose of fraud and deceit." This definition, he says, results from a comparison of all the authorities. But by making we must understand also addition, subtraction, or other material alteration, which indeed East himself admits; and by instrument, some paper or document which is intended to have and apparently may have some efficacy in law as the foundation of legal right or liability. A better definition is that in Bishop's "Criminal Law," vol. ii., sec. 482: "Forgery is the false making, or materially altering, with intent to defraud, of any writing, which, if genuine, might apparently be of legal efficacy in the foundation of a legal liability." For it is not every falsification of writing which constitutes forgery in a legal sense. If one writes letters and signs them with the name of another, which may be very injurious not only to the feelings of some other party but to his interests, he is not in law a forger, if no pecuniary rights, obligations, or engagements are or are intended to be directly affected by this falsehood. The falsification need not be of a name, nor of the whole of an instrument. It is forgery if it relate to a single word, or even to a part of a word, as a letter, whereby the legal operation of it is materially changed; nor do we know why the same rule should not include a change only in the punctuation. Forgery may consist in the application of a false name to a true instrument, or of a true name to a false instrument, or even of a genuine name to a genuine instrument, if the name thus appended gives rights or imposes liabilities which the party appending it had no right to give or impose, and he appended the name falsely for the purpose of fraud and deception. If one employed to draw a will at the dictation of the testator, wrote it all as dictated, excepting that he inserted one or more legacies without direction, or one or more material provisions of any kind, and then, presenting the will to the testator as written agreeably to his direction, thus obtained his signature, it has been held that this is a forgery. To constitute the forgery of a name, it must be the name of some person actually existing, or represented as actually existing; and if a name be written which belongs to a living man, but with an addition or description which corresponds to none that exists and prevents the name from attaching or belonging to any one, this is said not to be a forgery. The instrument need not be such that if genuine it would be certainly valid in law; but it must purport and appear on the face of it to have legal validity and efficacy; thus, in England, one may be convicted for the forgery of an unstamped note, although such a note could not be enforced any more than blank paper. It is said, however, that the falsification of an instrument which if genuine would be wholly illegal, that is, not merely void, but prohibited and itself an offence, is not forgery. When one forged the will of a living person, and, falsely representing him to be dead, obtained the money, this

was held to be forgery; and when one falsely and fraudulently appended to a will the name of a person who never had existed, this was also held to be forgery.—At common law, the publication or uttering of the forged instrument, or, in common phraseology, the making of any use of it, is not necessary to constitute forgery; thus, a man was convicted of forgery of a note, which he had made with fraudulent intent, but still retained in his pocket. In the United States, however, the statutes generally make the uttering or using the forged instrument essential to the offence; but the uttering is complete if an attempt is made to use the fraudulent instrument as intended, though the forgery be detected in season to defeat the fraud designed. It may be well to remark that it is a well settled rule of law, that while an intent to deceive and defraud is an essential element of forgery, yet this intent is often conclusively presumed from the forgery itself; thus, if one forge a note, or any name upon a note, and cause it to be discounted, it is no defence whatever to the charge of forgery that he intended to pay the note himself, and had actually made adequate provision to take it up so that no person should be injured.—The crime of forgery was so easily committed, and detected with so much difficulty, and attended in some instances with such ruinous consequences, that it was not only a capital offence in England, but it was one of those offences for which it is very difficult to obtain a pardon. But it is not now a capital offence in England or in any part of the United States.

FORGET-ME-NOT, the common name in several languages (Ger. *Vergissmichnicht*, Fr. *ne-m'oublie-pas*) of the plant *Myosotis palustris*



Forget-me-not (*Myosotis palustris*).

(With.), of the family *borraginaceae*; other species of the genus are called scorpion grass. The forget-me-not is common throughout Europe, and is sparingly naturalized in this country. It assumes a varied aspect according to its situation, being dwarf, rough, and hairy in dry places, as on old walls, but becoming larger and smoother in muddy ditches. It does well when planted in shady places in the garden, or even if cultivated in pots, and is a charming plant in spring and

early summer. Its flowers are borne in slender curving racemes, bending at the top like a scorpion's tail, whence it was formerly called *M. scorpioides*. Its bright blue flowers are in

many countries considered the emblem of friendship. The variety *laza*, which differs from the type in having smaller flowers upon longer stalks, is a native of this country, and common in wet places at the north. *M. verna* (Nuttall), a little, grayish, pubescent annual, from 5 to 12 in. high, with a very small whitish corolla, is quite common upon dry rocks, where the soil is very thin and parched, the plant disappearing on the approach of hot weather. *M. arvensis* is sometimes found, and supposed to be introduced; and *M. versicolor*, another European species, grows in fields in Delaware. Several species besides *M. palustris* are in cultivation, as well as some garden varieties; among the most conspicuous of these are *M. dissitiflora*, *M. Azorica*, and *M. alpestris*. The generic name (Gr. *μυσωρίς*) means mouse-ear, and this is the popular name of some of the species in England.—It is a singular fact in the history of popular nomenclature, that about 200 years ago the name forget-me-not was used for a species of *ajuga* (bugle), for the reason that this plant when chewed left such an unpleasant taste in the mouth that it was not likely to be soon forgotten.

FORK, an implement consisting of a handle and two or more prongs, used to lift certain substances. Table forks do not seem to have been known in antiquity, though archæologists have found articles among the rubbish in the Appian way and in the ruins of a Roman town in Champagne, which they considered to be table forks. The Jews and Etruscans did not use any at table, though they had forks for other purposes. The ancient Egyptians used a large fork for stirring the fire or water in the kitchens, and forks of wood were used by Egyptian peasants. The Greek word *κρέεσσα* signifies a fork, but merely a flesh fork, employed to take meat from a boiling pot, and not one used at table. The Latin words *furca*, *fuscina*, *furcilla*, and *fuscinula* are equally inapplicable to our modern forks. The first two were probably instruments which approached nearly to our furnace and hay forks. The *furcilla* was large enough for a weapon. The word *fuscinula*, which in modern times is used chiefly for a table fork, is not to be found in that sense in any of the old Latin writers. The old translations of the Bible only explain the Greek *κρέεσσα* by *fuscinula*. According to some records, the use of table forks seems to have been known in the 12th century, but only exceptionally. They are mentioned in the inventory of a prince's plate in 1379, but they did not come into more general use in Italy till the end of the 15th century. Galeotus Martius, in a book which he wrote upon Matthias Corvinus, king of Hungary (1458-1490), at whose court he resided, praises the king for eating without a fork, yet conversing at the same time, and never soiling his clothes. Martius states that forks were used at that time in many parts of Italy, but not in Hungary. He adds that meat was ta-

ken hold of with the fingers, which on that account were much stained with saffron, a condiment then put into sauces and soups. In the 16th century forks were not yet used in Sweden, and at the end of that century they were novelties even at the court of France. In the convent of St. Maur in France, the introduction of forks was opposed as sinful by the old and conservative monks, and advocated by the young and progressive brethren. In other monasteries, too, the use of forks was for a considerable time forbidden, and considered a superfluous luxury. Thomas Coryat, who travelled in 1608 on the continent, and published in 1611 an account of his travels under the title of "Crudities," says: "J observed a custome in all those Italian cities and townes through the which j passed, that is not used in any other country that j saw in my travels, neither do j thinke that any other nation of Christendome doth use it, but only Italy. The Italians, and also most strangers that are commorant in Italy, do alwaies at their meales use a little forke when they cut their meate. This form of feeding j understand is generally used in all places of Italy; their forkes for the most part being made of yronn or steele, and some of silver, but these are used only by gentlemen. The reason of this their curiosity is, because the Italian cannot by any means indure to have his dish touched with fingers, seeing all men's fingers are not alike cleane. Hereupon j myself thought good to imitate the Italian fashion by this forked cutting of meate, not only while j was in Italy, but also in Germany, and oftentimes in England since j came home; being once quipped for that frequent using of my forke by a certain learned gentleman, a familiar friend of mine, one Mr. Laurence Whitaker, who in his merry humour doubted not to call me at table *furcifer* only for using a forke at feeding, but for no other cause." The use of forks was at first much ridiculed in England; in one of Beaumont and Fletcher's plays "your fork-carving traveller" is spoken of very contemptuously; and Ben Jonson has also ridiculed them in his "Devil is an Ass."

The laudable use of forks,
Brought into custom here as they are in Italy,
To the sparing of napkins.

Dr. Johnson asserts that among the Scotch highlanders even knives have been introduced at table only since the revolution of 1688. The English, Dutch (*ork*), and French (*fourche*) have adopted the Italian names *forca* and *forchetta* for table forks, though these names were probably used at an earlier period to denote pitchforks, flesh forks, and other large instruments, for which formerly the Low German name was *Fork*. The Chinese use no forks, but have instead small sticks of ivory, which are often of fine workmanship inlaid with silver and gold.

FORKEL, Johann Nikolaus, a German composer and author, born at Meeder, near Co-

burg, Feb. 22, 1749, died in Göttingen, March 17, 1818. He was more distinguished as a writer upon musical subjects than as a composer. His musical works were numerous, and chiefly valuable in that they have preserved many excellent compositions of the older masters, carefully edited and enriched with added vocal and orchestral parts. At the age of 20 he devoted himself to an exhaustive study of the history of music in various nations and from the earliest times, visiting for that purpose the great libraries of Leipsic, Dresden, Berlin, Halle, and Prague, and collecting many works. The results of these studies were given to the world from time to time in a series of volumes treating of the theory of music, the general history of music, the music of the Hebrews and Egyptians, a life of Johann Sebastian Bach with a critical notice of his works, &c. Forkel left a great mass of valuable material. He was for nearly 40 years director of music at the university of Göttingen.

FORLÌ. I. A province of Italy, formerly part of the Papal States, bordering on the Adriatic, the republic of San Marino, and the provinces of Pesaro ed Urbino, Florence, and Ravenna; area, 716 sq. m.; pop. in 1872, 238,969. It comprises the three districts of Cesena, Forlì, and Rimini. On the coast and for some distance inland the surface is low and level, but the W. part is traversed by branches of the Apennines. The principal productions are wine, grain, hemp, flax, madder, saffron, anise, bees, and silk. No mineral of much value is found except sulphur, which is abundant. Earthquakes happen frequently. The interior suffers much from drought, while the inhabitants of the N. E. part are perhaps equally afflicted by unwholesome marshes, which occupy a large proportion of the land, especially near the coast. Manufactures have made more progress than in any other part of the former Papal States. II. A city (anc. *Forum Livii*), capital of the province, on the ancient Æmilian way, and on the railway between Bologna and Rimini, 38 m. S. E. of the former, and 80 m. N. W. of the latter; pop. of the commune in 1871, 38,480; of the city proper, about 18,000. It is a handsome town, surrounded by walls, and situated in a fertile plain at the foot of the Apennines, between the rivers Ronco and Montone. It is the seat of a bishop and of the prefect. It has a gymnasium and other schools, and a public library. Its cathedral contains the tomb of Torricelli. Of the nine other churches, the most interesting is that of San Girolamo, where rests the body of King Manfred. The town hall is remarkable for its council chamber, decorated with frescoes by Raphael. There are several handsome palaces, one of which, the Palazzo Guersini, is built after designs by Michel Angelo. The gallery of paintings contains many fine works. The manufactures are silk ribbons, silk twist, oil cloth, woollen goods, wax, nitre, and refined sulphur. The city is said to have been found-

ed in 207 B. C. by the consul M. Livius Salinator, and to have been named in his honor. It constituted a republic at one period in the middle ages, changed masters frequently during the wars of the Guelphs and Ghibellines, was added to the Papal States by Pope Julius II., taken by the French and made the capital of the department of the Rubicon in 1797, restored to the Roman see in 1814, and merged in the kingdom of Italy in 1860.

FORLÌ, Melezzo da, an Italian painter, born at Forlì in 1438, died about 1492. He was the first who applied the art of foreshortening to the painting of vaulted ceilings. About 1472 he painted the "Ascepsion" in the great chapel of the Santi Apostoli at Rome for Cardinal Riario. In 1711, when the chapel was being rebuilt, this painting was cut out of the ceiling and placed in the Quirinal palace, where it still remains.

FORMES, Karl, a German vocalist, born at Mülheim on the Rhine, Aug. 7, 1818. He received instructions from Oehrlein, a bass singer at Cologne, and Bassadone in Vienna, and made his first appearance in opera at Cologne, Jan. 6, 1842, as Sarastro in Mozart's "Magic Flute." In 1848 he was made a member of the court opera at Mannheim, and in 1844 he became primo basso of the imperial opera at Vienna. He took part in 1848 in the revolutionary movements in that city, and subsequently retired to Hamburg, and thence went to England, where in 1849 he appeared as a member of the German opera company at Drury Lane, and subsequently at the royal Italian opera, Covent Garden. In 1857 he came to the United States, making his first appearance in December of that year at the academy of music in *Robert le Diable*. Since that time he has made this country his home, with the exception of a brief residence in Europe. His voice was remarkable when in its prime for its depth, sweetness, and beauty of tone; and he was scarcely less distinguished as an actor than as a singer, possessing talent both as a tragedian and comedian in an eminent degree. In such rôles as Marcel in the *Huguenots*, Bertram in *Robert le Diable*, and Falstaff in Nicolai's "Merry Wives of Windsor," he was for a long time without a rival. He added also greatly to his reputation both in this country and in England by his admirable singing in Handel's "Messiah" and Mendelssohn's "Elijah."

FORMIC ACID (Lat. *formica*, an ant), a chemical product so named from its being found in the bodies of ants. It is artificially prepared by dissolving sugar, starch, or tartaric acid in water, adding sulphuric acid, and distilling the mixture on peroxide of manganese. Carbonic acid gas escapes, and formic acid mixed with water distils over. It is colorless and transparent, strongly acid, of specific gravity 1.1168; its composition is represented by the formula CH_2O_2 . Formic acid occurs in human blood, urine, spleen, flesh juice, and perspiration. In Watts's "Dictionary of Chemis-

try" 22 different ways of preparing it are given. Samuel Fischer was the first to make it by distilling ants, and Berthelot was the first to prepare it from inorganic materials.

FORMOSA (Port. *Ilha Formosa*, beautiful island; Malay, *Pekan* or *Pekando*; Chinese, *Tai-wan*, the terraced harbor), an island in the China sea, between lat. 21° 58' and 25° 15' N., and lon. 120° and 122° E., separated from the Chinese province of Fokien by a channel 90 m. wide; length 240 m., greatest breadth about 75 m.; area about 15,000 sq. m.; pop. estimated at from 2,000,000 to 8,000,000. A range of mountains occupies the eastern part, running from N. to S. through its entire length. As some of the summits are covered with perpetual snow, their height cannot be less than 12,000 ft. Among these mountains are several extinct volcanoes, and sulphur, naphtha, and other volcanic products are found. The E. coast is high and bold, and is entirely destitute of harbors. The W. shore is flat, and has some good ports accessible to vessels of moderate draught. The W. part is a very fertile, well cultivated plain. The chief productions are rice, sugar, camphor, tobacco, wheat, maize, beans, radishes, pepper, coffee, tea, indigo, cotton, flax, silk, and oranges, peaches, plums, and a great variety of other fruits. The wild animals are leopards, tigers, wolves, and deer. The ox and buffalo are used in tillage, and horses, asses, sheep, goats, and hogs are numerous. Gold is found in the mountains, and there are mines of bituminous coal in the N. part. Sulphur and salt are also found. The commerce of the island with the mainland of China is very extensive. The exports are rice, sugar, beans, sulphur, camphor, and timber. It imports saltpetre, opium, and manufactured goods. Of late years it has been much visited by American ships for purposes of trade. The western and most fertile part of the island is inhabited by Chinese, who have emigrated to Formosa in great numbers during the last two or three centuries. They are industrious and prosperous, skilful cultivators of the soil, and enterprising merchants. The Chinese portion of the island is a part of the province of Fokien, the governor residing at Taiwang-foo, a city of about 100,000 inhabitants. In virtue of treaties four ports have been thrown open to commerce, Tanahui and Kelung on the north, and Takao and Taiwang-foo on the W. side. The E. and mountainous part of Formosa is independent of the Chinese, and is inhabited by a warlike race of copper-colored barbarians, of whom the Chinese are in great dread, and with whom they are almost constantly at war. They are probably of the Malay division of mankind. They wear their hair long, have rings in their ears, and are clothed only with a piece of cotton stuff wrapped about the middle. They dwell in bamboo cottages raised on terraces 8 or 4 ft. high. They have no written language, and do not appear to have any priesthood. Their government is patriarchal, petty

chiefs and councils of elders ruling them in the manner of the American Indians. Their arms are lances, bows and arrows, and a few Chinese matchlocks. In their language the island is termed Kaboski, and also Gadavia. Their number is not supposed to exceed 20,000. Some of these people have been subdued by the Chinese, and are kept in small villages in a kind of prædial servitude.—The Chinese seem to have had no settlements in Formosa before the 15th century. In 1582 a Spanish ship was wrecked there, and the survivors brought the first account of the island to Europe. About 1684 the Dutch took possession of it and built several forts and factories; but in 1662 they were driven out by a famous Chinese pirate, Coxinga, who made himself king of the W. part, and transmitted the sovereignty to his descendants, who, however, submitted in 1683 to the authority of the Chinese emperor, to whom it has since been tributary. The Chinese colonists have frequently rebelled, and in 1788 an insurrection broke out which cost the imperial government 100,000 lives and an immense expenditure of money before it was suppressed. Psalmazar, whose extraordinary imposture excited so much attention in England at the beginning of the last century, pretended to be a native of Formosa, and published an account of the island which was entirely fictitious. Commodore Perry, who from 1852 to 1854 was employed by the government of the United States in concluding commercial treaties with China, Japan, and Siam, called attention to the importance of Formosa; and since then scientific expeditions have been sent out by the governments of England and Prussia, to survey the coast and to explore parts of the island with a view to establishing naval stations or colonies.

FORNARINA, La (the baker girl), the appellation of the reputed mistress of Raphael, and celebrated as the model of many of his pictures. She was the daughter of a baker residing in Rome near the church of St. Cecilia. Raphael, having accidentally seen her while she was washing her feet in the river, is said to have fallen in love with her. The most famous of the alleged likenesses of her are in Raphael's great fresco of Heliiodorus, in his Parnassus in the Vatican as Olio, in his "Agony of St. Cecilia," and in his "Transfiguration." His picture "La Fornarina" is supposed by Passavant to be intended for the improvisatrice Beatrice Pio, and the same biographer of Raphael doubts the story of the former having been his mistress.

FORNEY, John Weiss, an American journalist, born at Lancaster, Pa., Sept. 30, 1817. In 1838 he became an apprentice in the printing office of the Lancaster "Journal," and in 1837 editor and joint proprietor of the Lancaster "Intelligencer;" and in 1840 he united that paper with the "Journal." He removed in 1845 to Philadelphia, where he was long the editor of the "Pennsylvanian," one of the most decided of the democratic journals. In

1851 he was chosen clerk of the United States house of representatives, and was reelected in 1853. Meanwhile his connection with the "Pennsylvanian" had ceased, and he had become editor of the "Union," the democratic organ at Washington. He resigned this post in 1856, returned to Pennsylvania, and was chosen chairman of the democratic state committee. In January, 1857, he was democratic candidate for the office of United States senator, but was defeated by Mr. Cameron, and on Aug. 1 following began in Philadelphia the publication of "The Press," an independent democratic journal. Although he had advocated the election of Mr. Buchanan to the presidency, he became a determined opponent of his administration when the Lecompton constitution of Kansas became a topic of public debate; and he was again chosen clerk of the house of representatives in the 36th congress by the republicans. During the civil war he gave a constant support to the national government. In 1861 he began the publication, in addition to "The Press" in Philadelphia, of a weekly paper in the city of Washington entitled "The Chronicle;" this also began to appear daily in October, 1862. From 1861 to 1868 Mr. Forney was secretary of the United States senate. In 1867 he published "Letters on Europe," comprising a series of sketches of travel contributed to "The Press" while abroad; and in 1873 "Anecdotes of Public Men," a collection of papers published originally in the "Sunday Chronicle" and "The Press."

FORREST, Edwin, an American actor, born in Philadelphia, March 9, 1806, died there, Dec. 12, 1872. His father was Scotch, his mother of German birth. He exhibited from an early age a taste for the stage, and when 11 years old participated in theatrical representations as a member of an amateur club, sometimes performing female parts. His first appearance on the regular stage was on Nov. 27, 1820, when he acted Douglas in Home's play of that name. His next part, played in the same engagement, was Frederick in Mrs. Inchbald's "Lovers' Vows." A protracted professional tour in the west and south ensued, in which he won considerable reputation. He essayed Shakespearian characters first in 1822, in Cincinnati, where he performed Richard III. and Othello. His first great success was achieved May 26, 1826, in the Park theatre, New York, as Othello. This led to a long engagement at the Bowery theatre, where he won some of his greatest triumphs. In October, 1829, he went to the Park theatre, where he long enjoyed extraordinary popularity. There he first acted Metamora (Dec. 15, 1829) in John H. Stone's tragedy of that name, and Spartacus (Sept. 25, 1831) in Dr. Bird's "Gladiator," both of which were written to fit his peculiar talents. In 1835 he visited Europe, and after a long tour on the continent appeared as Spartacus in Drury Lane theatre, Oct. 17, 1836. He met with success everywhere, and received many courtesies

from eminent literary men and from those of his profession, particularly from Mr. Macready. In 1837, he married Catharine Norton Sinclair, daughter of John Sinclair the singer, and soon afterward returned to the United States, where he was welcomed by enthusiastic audiences. After an engagement in Philadelphia, he played at the Park theatre in New York, where he first appeared as Aylmere, May 24, 1841, in Robert T. Conrad's play of "Aylmere, the Bondaman of Kent," better known as "Jack Cade." This was one of his most effective characters, in which he appeared to the best advantage. In 1845 Mr. and Mrs. Forrest returned to London. During this visit, which lasted two years, a rupture occurred in the friendly relations between Forrest and Macready, and to the zeal with which the friends of the former espoused his quarrel was due the disgraceful riot in New York, May 10, 1849, during an engagement of Macready at the Astor place opera house. Soon after Forrest separated from his wife for alleged misconduct on her part, and in 1850 counter suits for a divorce on the ground of adultery were instituted. His conduct at this time alienated from him the sympathy of the better class of people. Mrs. Forrest obtained a divorce from him, forfeiting none of her honors and legal rights, and was decreed an allowance of \$3,000 a year as alimony, a decision which he contested up to the court of last resort. In 1850 Forrest purchased an estate on the Hudson river and built a house which he named Fonthill. He sold this, at a large advance on its cost, for a convent, and in 1855 bought a residence at Spring Brook, near Philadelphia, where he resided until his death. He retired from the stage in 1858, but reappeared in 1868 and again in 1867. His last engagement began on Feb. 6, 1871, in the Fourteenth street theatre, New York, during which he played Lear and Richelieu; but he was compelled by illness to retire. Three weeks before his death, he appeared in Steinway hall, New York, as a reader of "Hamlet" and "Othello." He died of apoplexy, surviving the attack only half an hour. Forrest accumulated a large fortune, estimated at upward of \$1,000,000. By his will he left a large part of his fortune to establish an institution for aged and destitute actors. His splendid library, which he had spent many years in gathering, the Shakespeare collection being said to be the finest in the world, was almost entirely destroyed by fire in his house in Philadelphia, Jan. 15, 1873. His biography, by the Rev. W. R. Alger, is in preparation.

FORSKAL, Peter, a Swedish traveller and naturalist, born in Kalmar in 1736, died in Yerim, Arabia, July 11, 1763. He studied at Göttingen and at Upsal, published a thesis in opposition to the then dominant philosophy of Wolf, and incurred the displeasure of government by a treatise on civil liberty. He was appointed to a professorship in the university of Copenhagen, and by recommendation of Linnæus was

attached with Karsten Niebuhr to the scientific expedition sent to Egypt and Arabia by the king of Denmark. He set out in 1761, and during two years preceding his death by the plague collected materials for three important works descriptive of the fauna and flora of the East, which were published under the editorial care of Niebuhr.

FORSTE, a town of Brandenburg, Prussia, on an island in the Neisse, 44 m. S. by E. of Frankfort-on-the-Oder; pop. in 1871, 7,950. It consists of the town proper and two suburbs; has a castle and two Protestant churches, considerable manufactures, and a trade in flax, horses, and cattle. There are six annual fairs.

FÖRSTER. I. *Ernst Joachim*, a German painter and writer upon art, born at Münchengossensstädt, Bavaria, April 8, 1800. He studied theology, philosophy, and philology at Jena and Berlin, but afterward devoted himself to painting, and in 1823 became the pupil of Cornelius at Munich. He was employed in painting frescoes in the Aula at Bonn and in the Glyptothek and arcades at Munich till 1826, when he visited Italy. At Pisa, Bologna, and other cities he collected interesting materials for a history of Italian art, and at Padua in 1837 discovered and restored the frescoes in the chapel of St. George. He made a valuable collection of designs by the old masters, prepared guide books for Italy and Germany, and wrote numerous works, the most important being on the history of art. Among these are: *Geschichte der deutschen Kunst* (5 vols., Leipsic, 1851-'59); *Vorschule zur Kunstgeschichte* (1862); *Denkmale der deutschen Baukunst, Bildnerei und Malerei* (9 vols., 1855-'65); *Raphael* (2 vols., 1869); and *Geschichte der italienischen Kunst* (2 vols., 1870). He also edited several of the works of Jean Paul Richter, and wrote *Wahrheit aus Jean Paul's Leben, and Denkwürdigkeiten aus dem Leben Jean Paul's* (Munich, 1863). II. *Friedrich*, a German historian, brother of the preceding, born Sept. 24, 1791, died in Berlin, Nov. 8, 1868. On leaving the university of Jena in 1813, he joined, with his friend the poet Körner, in the war of independence against France, composed stirring war songs, and rose to be captain. Subsequently he was professor at the school of artillery and engineering in Berlin till 1817, when he was removed by the government, to which some of his writings gave umbrage, and he found himself likewise hampered in his functions as adjunct professor at the university. He soon became connected with prominent literary journals, visited Italy with his brother, and received in 1829 an appointment at the royal museum, with the title of court councillor. He published poems, novels, plays, and a continuation of Chamisso's *Peter Schlemihl*, entitled *Peter Schlemihl's Heimkehr* (2 vols., Berlin, 1849). His most popular historical works relate to Wallenstein, Columbus, and especially to Frederick the Great, and include *Geschichte der Befreiungskriege 1813, 1814 und 1815* (8 vols., 7th ed.,

Berlin, 1865), and *Neuere preussische und deutsche Geschichte* (2 vols., 5th ed., 1867-'9).

FORSTER, *George*, an English traveller, died in Nagpoor in 1792. He was in the service of the East India company, and in 1782 undertook an overland journey from India to Russia. Disguised as a Mussulman merchant, and able to speak Hindoo, Persian, and the Mahratta dialect with facility, he set out from Lucknow, travelling northward by Ferozabad and Rampoor into the upper regions of the Punjab. He then proceeded by Bellaspore and Jambo through the vale of Cashmere, which had been visited before by no European traveller except Bernier. He passed by Cabool, Candahar, and Herat, to the southern coast of the Caspian sea, and travelled thence through Russia, arriving in England in 1784. After publishing "Sketches of the Mythology and Customs of the Hindoos" (London, 1785), he returned to Calcutta, where in 1790 appeared the first volume of his "Journey from Bengal to England," &c. It was republished in London in 1798, together with the second volume, which was printed from his manuscript. On the breaking out of hostilities with Tippoo Saib, Forster was sent on a mission to the Mahratta court of Nagpoor, where he died.

FÖRSTER, *Helarich*, a German pulpit orator of the Roman Catholic church, born in Glogau, Prussian Silesia, Nov. 24, 1800. He studied theology in Breslau, was ordained as priest in 1825, appointed canon of the cathedral in 1837, afterward inspector of the theological seminary and preacher at the cathedral. He opposed with great zeal the influence of Ronge, became in 1848 a member of the Frankfort parliament, attended in the same year the synod of the German bishops at Würzburg, and was made in 1853 prince-bishop of Breslau. As an author he made himself popular by his *Lebensbild Diepenbrock's* (2d ed., Breslau, 1859), and several other works.

FORSTER. I. *Johann Reinhold*, a German traveller and naturalist, born in Dirschau, Prussia, Oct. 22, 1729, died in Halle, Dec. 9, 1798. He was descended from an exiled Scottish border family, was educated at Halle and Dantzic for the clerical profession, and in 1753 became pastor at Nassenhuben, near Dantzic, but devoted himself especially to the study of mathematics, philosophy, and geography. In 1765 he went with his son Johann Georg as an agent of the Russian government to investigate the condition of the colony at Saratov in southern Russia, and in the following year repaired to London. He was for a time professor of natural history and of the French and German languages at Warrington, in Lancashire, and in 1772 accompanied Capt. Cook on his second voyage to the south seas, being engaged as naturalist of the expedition. After his return he published his botanical observations in a special work (London, 1776), and also "Observations made during a Voyage round the World on Physical Geography, Natural His-

tory, and Ethic Philosophy" (London, 1778). In 1780 he was appointed professor of natural history at Halle, an office which he retained till his death. He spoke and wrote 17 languages, and was familiar with general and especially with classical literature. Among his works, besides those above mentioned, are: *Liber Singularis de Byssu Antiquorum* (London, 1776); *Zoologia Indica* (Halle, 1781); *Beobachtungen und Wahrheiten* (Berlin, 1798); and *Geschichte der Entdeckungen und Schiff-fahrten im Norden* (Frankfort, 1784). The last was translated into English (London, 1786), and contains much useful information and ingenious conjecture, together with many ill-natured reflections, particularly on the English. II. **Johann Georg Adam**, eldest son of the preceding, a German traveller and naturalist, born at Nassenhuben, Nov. 26, 1754, died in Paris, Jan. 12, 1794. After accompanying his father to Saratov, he studied nearly a year in St. Petersburg, and went thence to England, where he gave instruction in French and German, and translated several works into English. He went with Cook on his second voyage round the world, a narrative of which he published after his return, receiving scientific notes for it from his father, and thus eluding the agreement by which the elder Forster was virtually prohibited from publishing a narrative. After residing in Paris and Holland, he was for six years professor of natural history in Cassel, whence in 1784 he passed to the same professorship in Wilna. He was appointed historiographer to an expedition round the world under the patronage of Catharine II. of Russia, but the project was thwarted by the Turkish war. He became in 1788 librarian to the elector of Mentz. In 1790 he accompanied Alexander von Humboldt to England, France, and the Netherlands; and Humboldt calls him his "celebrated teacher and friend, who has most vigorously and successfully opened the path in German literature of the scientific study of nature." In 1792, on the occupation of Mentz by the French, he engaged actively in support of republican principles, and in 1793 was sent to Paris as agent of the city to solicit its incorporation with France. After its recapture by the Prussians, Forster lost all his property, his books, and his manuscripts, and resolved to go to India, but died while studying the oriental languages in Paris. Besides numerous translations, his most important works are on subjects of natural history and ethnology, as *Kleine Schriften, ein Beitrag zur Länder- und Völkerkunde, Naturgeschichte und Philosophie des Lebens* (6 vols., Berlin, 1789-'97), and *Ansichten vom Niederrhein, von Brabant, Flandern, Holland, England und Frankreich* (3 vols., Berlin, 1791-'4). He was the first to translate into German the *Sakuntala* of Kalidasa. His widow, the daughter of Heyne, afterward known as Therese Huber, published a collection of his letters (2 vols., Leipsic, 1828-'9). His complete works were edited by his

daughter, with a critical notice by Gervinus (9 vols., Leipsic, 1843-'4).

FORSTER, John, an English author, born in Newcastle in 1812, died Feb. 1, 1876. He was educated at the university of London, and was a member of its first law class. With his classmates he established the "London University Magazine," out of which grew the "Englishman's Magazine," among his contributions to which was a series of biographical articles on the "Early Patriots of England," which were subsequently enlarged into his "Lives of the Statesmen of the Commonwealth." He pursued the study of law under Chitty, and was called to the bar, but soon became a valued contributor to periodicals. In 1834 he connected himself with the "Examiner," of which he became the sole editor in 1846; and from the time of his first connection he contributed largely to every number of it, in both the departments of politics and literary criticism. He was also for four years the editor of the "Foreign Quarterly Review," and for about a year of the "Daily News," after the retirement of Mr. Dickens. He was a frequent contributor to the "Edinburgh Review" and the "Quarterly Review." A collection of his "Historical and Biographical Essays" was published in 1858. His other principal works are: "The Life and Adventures of Oliver Goldsmith" (1848), enlarged into "The Life and Times of Oliver Goldsmith" (1854); "The Arrest of the Five Members by Charles I." (1860); "Debates on the Great Remonstrance" (1860); "Sir John Eliot, a Biography" (1864); "Walter Savage Landor, a Biography" (1868); and "The Life of Charles Dickens" (1871-'4). In 1855 he married the wealthy widow of Henry Colburn, the publisher. In 1856 he was appointed secretary to the lunatic commission, and was made commissioner of lunacy in 1861.

FORSTER, William Edward, an English statesman, born at Bradpole, Dorsetshire, July 11, 1818. His father was a minister of the society of Friends, who died during an anti-slavery mission to Tennessee. He married in 1850 a daughter of Dr. Arnold of Rugby, became prominent as a Bradford manufacturer and an ultra-liberal politician, and has represented that borough in parliament since 1861. He was under-secretary for the colonies from November, 1865, to July, 1866; and in December, 1868, he was appointed one of the charity commissioners and vice president of the committee of council on education, on which occasion he was made privy councillor. In 1870 he was the chief promoter of the new education law, and in 1871 of the ballot law.

FORSYTH. L. A. N. W. county of North Carolina, bounded W. by Yadkin river, and drained by its affluents; area about 250 sq. m.; pop. in 1870, 13,050 of whom 2,334 were colored. The surface is much diversified, and the soil is generally fertile. The chief productions in 1870 were 66,678 bushels of wheat, 178,146 of Indian corn, 76,569 of oats, 13,083 of Irish and

11,603 of sweet potatoes, 2,997 tons of hay, and 233,262 lbs. of tobacco. There were 1,546 horses, 2,166 milch cows, 2,788 other cattle, 6,606 sheep, and 11,287 swine; 6 manufactories of carriages and wagons, 1 of boots and shoes, 1 of cotton and 1 of woollen goods, and 5 flour mills. Capital, Winston. It is a N. county of Georgia, bounded E. and S. E. by the Chattahoochee river; area about 250 sq. m.; pop. in 1870, 7,983, of whom 1,121 were colored. The surface is hilly, and in some places mountainous. The soil is everywhere of fair quality, and in the vicinity of the rivers is alluvial and extremely fertile. The county is remarkably rich in minerals. Silver, copper, and considerable quantities of gold are obtained, and diamonds and other precious stones have occasionally been found. The chief productions in 1870 were 19,881 bushels of wheat, 68,075 of Indian corn, 9,769 of oats, and 217 bales of cotton. There were 7 manufactories of carriages and wagons. Capital, Cumming.

FORSYTH, John, an American statesman, born in Frederick co., Va., about 1781, died in Washington, Oct. 21, 1841. He graduated at Princeton college in 1799, and was admitted to the bar in Augusta, Ga., in 1802. He became attorney general of the state in 1808, representative in congress in 1812, and United States senator in 1818. In 1820 he was sent to Spain as resident minister, where he negotiated the treaty for the cession of Florida. In 1823 he was elected to congress, in 1827 governor of Georgia, and in 1829 United States senator. He opposed nullification, and voted for Mr. Clay's compromise act of 1833. He was secretary of state under Jackson and Van Buren from June 27, 1834, to March 4, 1841.

FORT BEND, a S. E. county of Texas, intersected by Brazos river, which is here navigable by steamboats during part of the year, and touched on the S. W. by San Bernard river; area, 920 sq. m.; pop. in 1870, 7,114, of whom 5,510 were colored. In the valleys of the streams the soil is alluvial and fertile. The rest of the county, consisting principally of prairies, is less productive, but furnishes abundant pasturage. Timber is found in the river bottoms, Brazos and San Bernard rivers being skirted by a thick growth of oak, ash, elm, and red cedar. The Buffalo Bayou, Brazos, and Colorado railroad passes through the county. The chief productions in 1870 were 233,505 bushels of Indian corn, 20,867 of sweet potatoes, 4,017 bales of cotton, 862 hhds. of sugar, and 28,960 gallons of molasses. There were 3,207 horses, 2,198 milch cows, 49,191 other cattle, and 9,475 swine. Capital, Richmond.

FORT DODGE, a city and the capital of Webster co., Iowa, on the Des Moines river, and the Iowa division of the Illinois Central railroad, at the terminus of the Des Moines Valley line, 70 m. N. W. of Des Moines; pop. in 1860, 672; in 1870, 8,095. The river, here about 250 ft. wide, affords water power, and coal and limestone are found in the vicinity.

The city contains a court house of stone, a high school building costing \$30,000, two national banks, 10 public schools, a semi-weekly and two weekly newspapers, a monthly periodical, and six or eight churches, and has considerable trade.

FORT DONELSON and Fort Henry, two fortifications in N. W. Tennessee, near the border of Kentucky, erected by the confederates late in 1861, and captured by the Union forces in February, 1862. The Cumberland and Tennessee rivers run nearly parallel, at a distance of about 10 m., for about 50 m. before they fall into the Ohio. Near the point where this parallel course begins, Fort Henry was built on the Tennessee, and Fort Donelson on the Cumberland. The positions were of importance as covering the passage by boats up these rivers, and as protecting the railway communication between Memphis and Bowling Green, Ky., which was then the central point of confederate operations in this region. In February, 1862, a combined naval and military expedition was planned against these forts. Admiral Foote arrived before Fort Henry on the 6th, and commenced the attack without waiting for the arrival of the land forces. After a bombardment of an hour the fort was surrendered; but the garrison, about 3,000 strong, escaped to Fort Donelson, with the exception of about 60 who were made prisoners. Gen. Grant with about 80,000 men moved, partly by water and partly by land, upon Fort Donelson, which was now commanded by Gen. Floyd, formerly United States secretary of war, who had in all about 15,000 men. Next in command were Gens. Pillow and Buckner. On the 13th about half the Union force had come up, and there was sharp skirmishing, in which each side lost about 200 in killed and wounded. On the 14th the gunboats arrived, and in the afternoon opened fire, and had nearly silenced the batteries of the fort when the steering apparatus of the two largest vessels was shot away, and the fleet was forced to withdraw, with a loss of 54 men. Grant, meanwhile, was proceeding to invest the fort, when on the morning of the 15th the confederates made a sudden sally, hoping to break through the lines of investment and make their way to Nashville; but after gaining some considerable advantages they were, late in the afternoon, driven back into their intrenchments by superior numbers. The loss on each side was about 2,000 killed, wounded, and prisoners. During the night a council of war was held, in which it was decided that the fort must be given up. But Floyd declared that he would not surrender himself; he said, "You know my position with the federals: it would not do." Pillow was in favor of still trying to cut their way out; in any case, he would not make the surrender. It was finally decided that Floyd should make over the command to Pillow, who should in turn make it over to Buckner, and in the mean while Floyd and Pillow might try to save their re-

spective commands. About half of these, some 2,000, succeeded in getting across the river, and escaped. On the morning of Sunday, Feb. 16, Grant was drawn up ready to assault, when a flag of truce came from Buckner, who proposed the appointment of commissioners to agree upon terms of capitulation, and asked for an armistice until noon for that purpose. Grant replied: "No terms other than an unconditional and immediate surrender can be accepted. I propose to move immediately upon your works." Buckner responded: "The overwhelming force under your command compels me, notwithstanding the splendid success of the confederate arms yesterday, to accept the ungenerous and unchivalrous terms which you propose." The number of prisoners was about 13,000, with 48 guns, and large quantities of small arms, ammunition, and supplies. The conduct of Floyd and Pillow was sharply censured by the confederate government, and both were suspended from their commands.

FORT DUQUESNE. See PITTSBURGH.

FORT EDWARD, a village and town of Washington co., New York, on the E. bank of the Hudson river, and on the Champlain canal, 40 m. N. of Albany; pop. of the village in 1870, 3,492; of the town, 5,125. The Rensselaer and Saratoga railroad and the Glen's Falls branch unite here. The village contains a weekly newspaper, two national banks with a capital of \$370,000, a state bank with \$100,000 capital, extensive manufactories of "congress bits" and of turbine water wheels, three saw mills, a foundry and machine shop, a blast furnace, a brewery, two manufactories of stoneware, and one each of paper, malt, matches and brooms, razor strops, and fanning mills. The Fort Edward collegiate institute in 1872 had 15 instructors, 420 pupils, of whom 141 were females, and a library of 1,000 volumes.

FORTESCUE, Sir John, an English lawyer, who lived in the reigns of Henry VI. and Edward IV. The place and date of his birth are unknown; he is supposed to have died about 1485. In 1426 he was appointed one of the governors of Lincoln's Inn, and in 1442 chief justice of the king's bench. He was a zealous Lancastrian, and when in 1461 the fortune of war made Henry VI. a fugitive, Fortescue accompanied him to Scotland, where Henry is supposed to have appointed him chancellor of England, by which title he has been mentioned by several writers. Soon afterward the Yorkists, who at that period controlled the parliament, included him in the act of attainder which was passed by them against the king, queen, and other prominent Lancastrians. In 1464 he fled to the continent with Queen Margaret and her son Edward, and remained abroad several years attending on the royal exiles. He returned with them to England, but after the battle of Tewkesbury in 1471 he became a prisoner to the victor, Edward IV. Having obtained his pardon and liberty, he withdrew to Gloucestershire, and there passed the rest of

his life in retirement. The most celebrated of his works is his treatise *De Laudibus Legum Anglia*, which is written in the form of a dialogue, the interlocutors being Prince Edward and the author. The earliest edition is that of Whitechurch, published in the beginning of the reign of Henry VIII., and the latest that of A. Amos (Cambridge, 1825). The oldest translation is by Mulcaster (London, 1516).

FORT GAINES, a town and the capital of Clay co., Georgia, on the Chattahoochee river, at the terminus of a branch of the Southwestern railroad, 155 m. S. by W. of Atlanta; pop. in 1870, 758. It is a shipping point for cotton. On Colamoka creek, a few miles S. E., are several ancient artificial mounds, the largest of which is 75 ft. high, with a level surface at the summit, 80 by 80 yards in extent. From the base a broad canal, 500 yards long and in some places 12 ft. deep, extends to the creek.

FORT GARRY, Manitoba. See WINNIPEG.

FORTH, a river of Scotland, the third of that country in size, and one of the most noted for romantic scenery. It is formed by the confluence of two small streams, the Duchray and the Dhu, which unite on the N. E. slope of Ben Lomond. Thence, under the name of the Avendow or Black river, it flows E. through the fertile valley of the Laggan, shut in on either side by hills, and after receiving one or two tributaries assumes the name of Forth. From this point it begins to present the remarkable sinuosities which form its chief characteristic, now winding gracefully through a rich level country, now doubling and flowing W., again sweeping to the E., describing at times almost complete circles, and forming all along its course many beautiful peninsulas. The most notable of these windings, called the "links of Forth," occur between Alloa and Stirling, the distance between which places, in a straight line, is about 6 m., while by water it is 12 m. The Teith, Allan, and Devon are its largest tributaries. At Kincardine it begins to widen into an estuary, called the frith of Forth, between the counties of Clackmannan and Fife on the north, and of Linlithgow, Edinburgh, and Haddington on the south. The frith contains several islands, and a great abundance of herring and other fish; length 50 m., greatest breadth 15 m. The general course of the Forth is E. or S. E. Its depth is from 8 to more than 87 fathoms, and its bottom is generally muddy. The tide sets up from the sea as far as Stirling bridge, a distance of 70 m. It is navigable thus far for vessels of 100 tons, and to Alloa for vessels of 800 tons. Its length to the sea, including all its sinuosities, is about 170 m., though in a direct line it would not exceed 90 m. The Forth and Clyde canal, 88 m. in length, connects those two rivers.

FORTIFICATION, the military art of preparing a place to resist attack. The means used for this purpose may be those presented by nature, as woods and rivers, or those formed by art, as shelters of earth, wood, or stone, or a combi-

nation of both. The artificial obstacles thus used are divided into two classes, permanent and temporary fortifications. When they are of a durable character and the position is to be occupied permanently or for some indefinite period, they belong to the former class; but when the position is to be occupied only for a short time or during the operations of a campaign, they are sometimes constructed in great haste and often of perishable materials, and receive the name of temporary or field fortifications. I. PERMANENT FORTIFICATIONS. These are essentially defensive in their nature, and their object has not changed with time. Their history, like that of man, may be divided into three principal epochs, ancient fortifications, fortifications of the middle ages, and modern fortifications.—1. *Primitive and Ancient Fortifications.* The oldest form of fortification appears to be the stockade, which up to the end of the 18th century was still the national system with the Turks (*palanka*), and is even now in full use in the Indo-Chinese peninsula. It consists of a double or triple row of the trunks of stout trees, planted upright and near each other in the ground, forming a wall all around the town or camp to be defended. Darius in his expedition among the Scythians, Cortes at Tabasco in Mexico, and Capt. Cook in New Zealand, all came in contact with such stockades. Sometimes the space between the rows of trees was filled up with earth; in other instances the trees were connected and held together by wickerwork. The next step was the erection of masonry walls instead of stockades. This plan secured greater durability, at the same time that it rendered the assault far more difficult; and from the days of Nineveh and Babylon down to the close of the middle ages, masonry walls formed the exclusive means of fortification among all the more civilized nations. The walls were made so high that escalade was rendered difficult; they were made thick enough to offer a lengthened resistance to the battering ram, and to allow the defenders to move about freely on the top, sheltered by a thinner masonry parapet with battlements, through the embrasures of which arrows and other missiles might be shot or thrown against the assailants. To increase the defence, the parapet was soon built overhanging, with holes between the projecting stones on which it rested, so as to allow the besieged to see the foot of the wall and reach an enemy who might have got so far by direct missiles from above. For a similar reason towers, which at first were nothing more than square or semicircular projections, built from distance to distance in the wall itself, were devised, and subsequently were divided into stories, each of which was provided with loopholes to flank the adjacent towers and the straight portions of the wall between them. Each tower could be isolated from the straight portion of the wall adjacent by an interruption at the top, over which communication was had

by a temporary bridge. These defences were found to be insufficient against the ingenuity and skill of the assailant, who by means of covered galleries of timber gradually won his way to the foot of the wall, when, by breaking his way through it or undermining it, he overcame or removed the obstruction between him and the assailed. This led to the use of wide and deep ditches surrounding the place, forming a formidable obstacle to the modes of attack then used. When it could be obtained, the ditches were filled with water. With the decadence of the Roman empire the art of fortification, like other branches of the military art, fell into decay.—2. *Medieval Fortifications.* The principal works that characterize the middle ages are the castles placed in the most inaccessible positions on the lines of communication which the little inland commerce that was still carried on was obliged to traverse. They were provided with every possible device for an obstinate passive defence, being surrounded by a wide and deep ditch or moat, over which a drawbridge was the only communication to the main entrance, which was flanked by towers on the exterior, and closed with massive doors; the winding passage that led into the castle being further secured by a grated portcullis, which could be dropped at a moment's notice to arrest a sudden assault. Loopholes and machicoulis in and on the walls and towers were added. In addition, there was a high interior tower, termed a keep or donjon, which, commanding the exterior, was also a watch tower over the adjacent country. This, the last defensible point, was often provided with a secret subterranean passage, having its outlet in some concealed spot on the exterior, by which succor could be introduced to the castle, or the garrison find safety in a stealthy flight. The fortifications of towns during this period partook of the same characteristics as those of castles.—3. *Modern Fortification.* This begins with the invention of gunpowder and its application to military purposes. We divide it into periods according as we find the art practised in Europe. There are four marked periods, viz.: 1, during the 14th, 15th, and 16th centuries; 2, the 16th and 17th centuries; 3, the 17th and 18th centuries; 4, from the 18th century to the present time. The first was noted for the rise and growth of the bastioned system; it is supposed to have originated in Italy, and was during this period the only one used in Europe. Most of the engineers who superintended the construction of the works were Italians, and it is therefore generally known as the Italian system. The second period was noted for the modifications and improvements in this system made in Holland during its war of independence with Spain. The third period was noted for the improvements made in the bastioned system by the French. The fourth period is noted particularly for the objections made to the bastioned system and the proposal of a new one as a

substitute. This new method is known as the polygonal system, and as many recent fortifications in Germany have been constructed according to it, it is often called the German system. Whatever be the system used, the object is the same, that is, to make the place so strong that to gain possession of it the enemy will be compelled to resort to the operations of a siege or blockade. Whatever be the diversities of opinion on the best mode of effecting this object, they all agree on certain general conditions as necessary. These may be summed up as follows: 1. They should be strong enough to resist with success an open assault. 2. They should have secure and easy communications for the troops, both within and to the exterior. 3. They should be so planned that every exterior point within cannon range shall be swept by the fire from the work. 4. They should be provided with bomb-proof shelters for the troops, and magazines of provisions and munitions of war. 5. They should be provided with all the accessory means of defence that the natural features of the position may afford.—The most convenient mode of fortifying a position in a simple manner consists in enclosing it with

a rampart surmounted by a parapet, with a ditch. The latter when dry has its sides revetted with masonry. The accompanying profile (fig. 1), which is a section made by a vertical plane perpendicular to the general direction of the intrenchment, will show the form of parapet and ditch generally used. When the place fortified is expected to contain the defenders only, called the garrison, it is termed a fort. If it surrounds a town, or is expected to contain other persons than those designed to defend it, it is called a fortress. For both cases the character of the fortification is the same. The rampart is an earthen mound raised above the natural surface of the ground upon which the parapet is placed, and serves to give the troops a commanding view over the ground exterior to the work, while it increases the obstacles to an open assault by the additional height it gives to the scarp. The top surface in rear of the parapet, called the terreplein, affords a convenient and secure communication for the troops. The form and dimensions of the rampart are so arranged that it shall afford cover to the troops and to the armament, and facility for firing over it by the

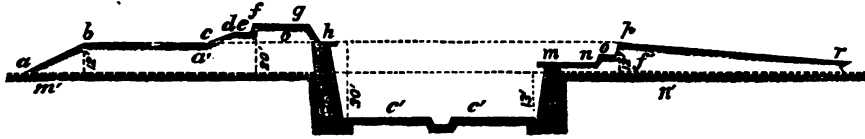


FIG. 1.—*a*, the rampart, of which *a b* is the slope, and *b c* the terreplein; *b'*, the parapet, of which *c d e f g h* is the outline; *c' e'*, the main ditch; *d'*, the scarp wall; *e'*, the counterscarp wall; *e o p* the outline of the banquette and interior slope, and *p r* the glacis; *m' n'*, the natural surface of the ground; *f*, the interior crest; *f g*, the superior slope; *g h*, the exterior slope; *f e*, the interior slope; *d e*, the banquette tread; *c d*, the banquette slope.

defence both with artillery and small arms. The ditch serves the double purpose of increasing the obstacles to be overcome by the enemy and furnishing the earth to form the rampart and parapet. To give strength and durability, the faces are revetted with walls of masonry, called respectively scarp and counterscarp walls. When dry, the ditch is made from 20 to 80 yards wide, and receives a slight slope toward the middle, where a small drain called a cunette is dug to receive the drainage and keep it dry. When wet, the ditches are wider. Scarp walls are of three kinds: 1, the ordinary retaining wall, strengthened by counter forts; 2, the same with relieving arches; 3, detached in part or wholly from the rampart. They are usually made not less than 80 ft. high, which is sufficient to prevent an escalade if the defence offer an ordinary resistance. Counterscarps are ordinarily of the first and second class, and are generally from 18 to 24 ft. high. The height of the interior crest of the parapet above the exterior ground is called the command, and its height above the bottom of the ditch the relief. The covered way is an open passage bordering the ditches, forming a continuous communication around the work,

sheltered from the enemy by an embankment high enough to cover the troops using it. This embankment is arranged like an ordinary parapet, having on the exterior a gentle slope or glacis. Slopes and dimensions of profile are as follows: scarp and counterscarp slopes, $\frac{1}{4}$ (or 1 base to 24 altitude); exterior slope, $\frac{1}{4}$ (45°); superior slope, $\frac{1}{4}$; interior slope, $\frac{1}{4}$; banquette slope, $\frac{1}{4}$; rampart slope, $\frac{1}{4}$; terrepleins, 8 ft. below interior crest; berm, 2 ft.; thickness of parapet, 25 ft.; height of interior crest above banquette tread, $4\frac{1}{2}$ ft.; width of banquette treads, from 2 ft. to 6 ft.; general width of terreplein, 48 ft. The continuous line enclosing the place is called the enceinte or main enclosure. Although a great diversity of figures may thus be presented by the outline of the work enclosing the place to be fortified, they may all be classed under four heads, to each of which engineers have applied the term system of fortification. These four classes are: 1, circular; 2, polygonal; 3, tenailed; 4, bastioned. The circular system consists of a work the plan of which is circular or curved. The polygonal is when this plan is a polygon with salient angles only, or where the reënterings are very slight. The tenailed is where

the plan consists of a tenailed line, the reëntering angles being between 90° and 100° , and the salient angles not less than 60° . The bastioned consists generally of two faces and two flanks, the extremities of the flanks being connected by curtains. A work consisting of an enceinte alone would restrict the garrison to a passive defence, and would be more or less exposed to surprise. To provide against the latter, and to enable the garrison to make a more active defence by operating on the exterior of the place, engineers have devised certain exterior defences called outworks without the enceinte. Others have been placed within the enceinte, called interior works, more particularly for the purpose of defending any breach that may be made in the main work. When an interior work is detached from the enceinte and is organized to receive the garrison and rely on its own resources after the main work has fallen, it is called a citadel. Owing to the form and height of the parapet, its fire can take effect only at some distance beyond it. The enemy having gained the ditch will not be exposed to the fire from the works unless some arrangement has been made for this emergency. Such points where the enemy can find shelter are called dead angles or spaces. These may be removed either by arranging the lines of the work with this object in view, as in the bastioned system, or by means of auxiliary works, termed caponnières, scarp galleries, counterscarp galleries, &c., as in the polygonal system.—*Bastioned System.* If, supposing the place enclosed by a bastioned system, we connect the salients of the bastions by straight lines, these will form a polygon of as many sides as there are bastions. If the curtains be produced, they will form a second polygon within the first. They are respectively called exterior and interior polygons. Either of these may be taken as a general outline to enclose the place to be fortified. The exterior polygon is generally used, and sometimes called the polygon of the fortification. It may be regular or irregular. We will suppose the site to be fortified to be level or approximately so, and the polygon to be regular. There is an intimate relation between the length of the side of the polygon and the lengths of the lines of the fortification, which will be referred to hereafter. Assume the length of a side, called the exterior side, to be 380 yards. To lay off the lines of the work, some one line must be selected as the directing one. In permanent fortifications the line of intersection of the front face of the scarp wall with the top or upper surface of coping is taken, and receives the name of magistral. In giving the method for locating the lines on one side or front, all the information necessary for the entire work will be known. Bisect the side of the polygon by a perpendicular, and lay off on it inside the polygon a distance equal to $\frac{1}{4}$, $\frac{1}{3}$, or $\frac{1}{2}$ of the side, according as the polygon is a square, a pentagon,

or a polygon of a greater number of sides. In this particular case lay off $\frac{1}{4}$, or 68.88 yards; this will be the distance for the hexagon or any greater polygon. Lines drawn through this point and the extremities of the exterior side determine the directions of the faces and the lines of defence. We may assume the lengths of the faces and then deduce the flanks and curtain, or assume the curtain and deduce the others. If we take the first plan, we lay off from the salient a distance equal to $\frac{1}{4}$ of the exterior side, which gives us the length of the face and the positions of the shoulder angles; then draw the flanks, making an angle of 110° with the lines of defence or 100° with the curtain. Lay off on each flank a distance of 50 yards and join their extremities by a straight line. This will give the curtain, 140 yards in length. This length of curtain admits of the flanks having a relief of 44.50 ft., and at the same time thoroughly sweeping the ditch in front of the curtain by the fire from them. Let XX , fig. 2, be the exterior side; then, following the foregoing construction, we have XY the magistral of the face, YZ of the flank, and ZZ the curtain. The line XY produced to Z , the opposite extremity of the curtain, is the line of defence. From their positions it is evident that an intimate relation exists between these lines; any change in one affects all the others. The angle at X is called the salient angle of the bastion; XYZ , the shoulder angles; YZZ , the curtain angles; and XXY , the diminished angle. From an examination of the figure, it is seen that we have now laid out the plan of the enceinte. The heavy line parallel to the one constructed is the interior crest. Although drawn parallel in the figure, it is not absolutely so in practice. To explain these details would extend this article to a degree that is not admissible. The other lines are easily understood by looking at the profile (fig. 1) taken on $m'm'n'n'$. Communication from the interior to the exterior is made by a postern through the middle of the curtain that comes out 6 ft. above the bottom of the ditch. A wooden ramp is used to descend from the postern to the ditch. In front of the curtain is placed the tenaille O , its form being a curtain parallel to that of the enceinte with two wings of the scarps of which are on the prolongations of the scarps of the faces. It is separated from the curtain by a ditch 18 yards wide, and from the flanks by ditches 11 yards wide. It is intended to mask the masonry of the curtain and flanks and cover the postern. It is arranged for defence having its fire to bear upon the ditches. The object of the double caponnière P is to afford a secure communication across the ditch, and to be a defensive work for the main ditch. The object of the demi-lune G is to secure the gates of the place from a surprise, to mask the flanks and curtains of the enceinte from the enemy's batteries, and to give cross fires on the salients of the bastions. They favor sorties by the strong reën-

terings made in the front. The cuts K K are made to isolate its extremities from the salient portion, and prevent the enemy from driving the defence from the redoubts of the reëntering places of arms if he should gain possession of the demilune. The demilune redoubt J is for the purpose of sweeping at close range the terreplein of the demilune, and render its defence more obstinate by the support it receives from the redoubt. The covered way D D, bordering the ditches of the main work and

demilune, forms a secure communication around the entire work. It is an indispensable out-work, and is of the highest importance where an active defence is to be made. Traversees, α, α , are placed at intervals to protect the troops in it from ricochet fire, and are arranged for defence. The covered way is broken forward in the reëntering angles for the purpose of enlarging the covered way at these points, and producing a flanking arrangement by which the glacis can be swept and a cross

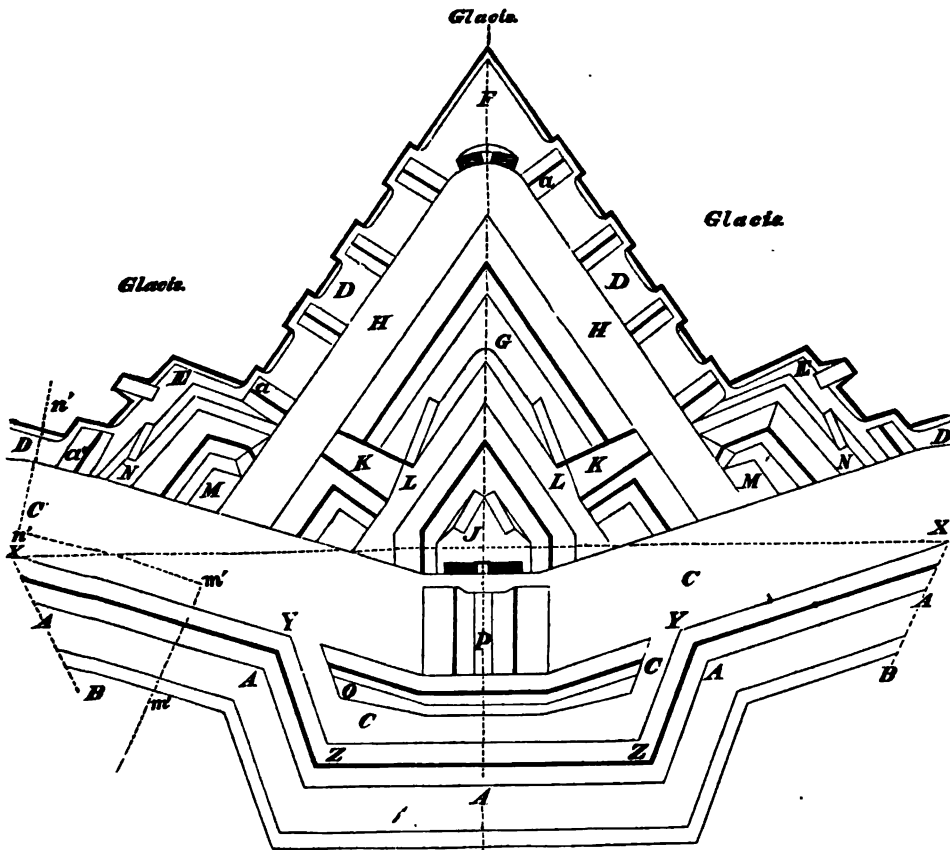


FIG. 2.—A A A A, the enceinte or body of the place, or main enclosure; B B, the bastions; C C C C, the main ditch, or the ditch of the enceinte; D D D D, the bastion and demilune covered ways; E E, the reëntering places of arms; F, the salient place of arms; G, the demilune; H H, the demilune ditch; J, the demilune redoubt; K K, cuts in the demilune; L L, the ditch of the demilune redoubt; M M, the redoubts of the reëntering places of arms; N N, ditches of the redoubts; O, the tenaille; P, double caponnière; X X, exterior side; α, α , traversees of the covered way.

fire brought to bear upon the ground in front of the salients. Within this enlarged space, or reëntering place of arms, a redoubt M is placed. Its object is to strengthen the covered way and sweep with its fire the enemy's establishments on the glacis of the demilune. Sometimes a redoubt is placed in the salient place of arms. The surface of the embankment of the covered way is made, from the interior crest to the exterior, with a gentle slope. The principle to be attended to in arranging these

glacis planes is, that they should all be swept by the artillery fire of the works in their rear, and by the musketry fire at least of the bastion face. From what has been said, it will be seen that in this system, when the relief and plan are suitably arranged, the fortification possesses the advantage of having its ditches thoroughly swept from within the main work itself, of bringing a cross and flank fire to bear upon the approaches on the salients, and furnishing a strong direct and cross fire upon the

ground in advance of the curtains and the faces of the bastions.—The bastioned system came into existence after the application of gunpowder to military purposes. The precise date and name of its author are not known. The best authorities give as the date of its origin the close of the 15th or the beginning of the 16th century. The system as it appeared in Italy, and as practised by the Italian engineers of that date, was soon adopted throughout Europe. In its application in the different states, it was varied and modified in different degrees. These variations and modifications were due to the discussions among the profession as to the best method of combining the parts, of adapting it to the natural features of the country where applied, and to the natural characteristics of the people. From these arose the schools known as the Italian, Dutch, French, Spanish, German, and Swedish. The Italian school was characterized by very small bastions connected by very long curtains, with the flanks perpendicular to the curtains, and no outworks. In some cases, a small and very obtuse bastion was placed at the middle of the curtain. The ditches were about 33 yards wide and 24 ft. deep. The defects of this plan were soon felt, and an improvement was made by shortening the curtain, enlarging the bastions, and introducing a covered way, with a tête de pont to cover the communication across the main ditch at the middle of the curtain. In the Netherlands, the low country, want of time and money, and presence of water on or near the site, led to decided changes in the system. From the nature of their struggle, their defensive works were based upon a strictly passive defence. The characteristic features of the Dutch school were wide ditches filled with water, low ramparts without revetment walls, an enceinte often within one, and numerous outworks. The French school was characterized by a combination of the best features of the Dutch and Italian schools. Retaining the profile of the latter, the outworks of the former were added. It is to this school that we are indebted for the rules and principles of the bastioned system. Scientific and systematic fortification may be said to date from Vauban, so perfect are his works in comparison with those of his predecessors throughout Europe, in the arrangement of the details, the proportions of the lines, and the adaptation of the system to the requirements of every locality. The characteristics of the Spanish school are the increase in dimensions of profile and height of scarp, with interior intrenchments, and often a bomb-proof keep, the object being to render the defence more obstinate. They made free use of detached works, but, like the main work, they were generally organized for a strictly passive defence, depending upon their own resources rather than coöperation from the main or other works. They frequently omitted the covered way. The works of the German school differ

but slightly from those of the French and Italian. In some fortresses, the adoption of casemated batteries, which in recent years have formed so important a part in their works, was the distinguishing feature. This school reckons a number of original writers on fortifications, among the most noted of whom are the celebrated Albert Dürer, Speckle, and Rimpler. Many of the characteristic features of the French school were suggested by Speckle many years before they were adopted in France. Swedish engineers paid special attention to covering the faces of their works from enfilading fire. They made free use of casemated batteries, having them often in several tiers. They also arranged their interior parts so that each should contribute to the defence of the others and be capable of an independent resistance.—*Polygonal or German System.* This system has been proposed by several engineers of distinction, but its most ardent advocate has been the French engineer Montalembert. The leading features of this system are as follows: 1. To occupy the principal points of the position to be fortified that are liable to be attacked by works which shall contain within themselves all the resources necessary for a vigorous defence; these works to be placed in reciprocal defensive relations with each other, but so arranged that the falling of one of them into the hands of the enemy will not compel the loss of the others, nor the surrender of the place. These are called independent works. 2. To enclose the space in rear of these by a continuous enceinte; or connect them by long curtains; or employ them as a system of detached works in advance of a main work, for the purpose of forming capacious intrenched camps. The enceinte, when used, to be polygonal in plan with a revetted scarp, and so arranged with the independent works as to sweep in the most effective manner by their fire the approaches of the enemy, both near and distant. 3. To provide the most ample means for an active defence by covered ways strengthened by casemated redoubts, and ample communications between them and the main work for sorties in large bodies. 4. To shelter the artillery from the enemy's fire, and so arrange it that it shall be superior to that of the besiegers at any period of their attack. In this system the plan of the enceinte and of any independent work when detached is polygonal, the ditches of which are flanked by caponnières, which are casemated structures of two and sometimes three tiers of fire; or the front may be either slightly tenailed or of a bastion form, with short casemated flanks to flank the main caponnière; the main flanking arrangement for the ditch being the caponnière, a work exterior to the enceinte. The caponnière in many cases extends across the ditch, projecting into the outwork on the other side, and also into the interior of the enceinte. It serves in this case three purposes: to flank the ditch; as a

redoubt for the outwork; and as an interior work to sweep the terrepleins of the enceinte. Where the caponnière is not flanked from the main work, by scarp galleries or batteries, other arrangements are devised, as projecting wings, or small caponnières attached to the main one. Free use of casemated defences is made in this system; also, systems of mines for interior as well as exterior defence are arranged in connection with the counterscarp galleries. The profile differs but slightly from that used in the bastioned system. The use of detached and semi-detached scarps affords facilities for arranging corridors or open passages around the works, and opportunities for loopholes. To sum up, this system proposes to flank the ditches not from the work itself, but by auxiliary works; to provide an overwhelming artillery fire protected in defensive casemates; and to organize strong permanent works within and independent of the enceinte, which are to serve as a secure retreat for the garrison when forced to give up its defence. The advantages of this system, compared with the bastioned, may be stated as follows: 1, that the interior space enclosed by equal lengths of enceinte is greater than in the bastioned; 2, that the faces of the work, from the greater obtuseness of the salient angles, are less exposed to ricochet fire; 3, that the fire of the faces has a better bearing on the distant defence; 4, that, requiring fewer points on a given extent of line to be fortified, there will be fewer flanks, and more artillery will be disposable for the faces and curtains; 5, that the besiegers will be forced to a greater development of trenches for the same number of points. On the other hand, the system is deficient in the strong concentrated cross fires that exist in the bastioned system in front of the salients. The flanking arrangement of the ditch being an exterior work, as soon as its fire is silenced the main work will be exposed to an escalade. It is further objected to this system that the numerous works of masonry can be easily ruined by distant batteries of heavy calibre, especially when weakened by loopholes and casemates, as is the case in the caponnières and defensive barracks; that the distribution of troops and material of war throughout the independent works deprives the defence of that unity and concert of action so necessary for a successful resistance; that the works are more costly from the greater amount of masonry used; and finally, that it is imprudent to abandon a system that has been tested for one that does not possess this advantage. In the discussions which have taken place upon the merits of the two systems between engineers advocating them, an exaggeration of the defects and the depreciation of the advantages of the system analyzed seem to be the governing principles. The truth is that both possess great merits, and due credit should be given to each system.

The fragility of masonry and the ease with which it can be destroyed by heavy projectiles, the increase in calibre of the cannon used and in accuracy of firing, must naturally incline engineers to limit its employment as much as possible; reserving its use for positions where it will not be exposed, or is so covered that nothing can be feared from the besieger's guns. —It is unnecessary to dwell here upon the circular and tenailed systems. They observe the general conditions that we have given as common to all systems of permanent works. The advantages they possess and the objections that are made will be apparent to those who have carefully examined the bastioned and polygonal systems.—*General Remarks.* So far in the consideration of fortifications we have confined ourselves to the first three conditions and an allusion to the fourth. No work would be complete without bomb-proof shelters for the troops and magazines, whatever be the system adopted. The details of these works must be looked for in books treating specially of these constructions. The fifth general condition involves the use of water when it can be obtained, the character of the soil, the use of mines, and the arrangement of the parts of a work when placed on an irregular site. The last case calls largely upon the skill and the science of the engineer. When the terreplein of a work is arranged so as to shelter the troops and matériel by the parapet or by traverses from the fire of the enemy who occupies ground higher than the site of the work, it is said to be defiled from that fire. This fire may be direct or in reverse. These problems of direct and reverse defilement are among the most important in the profession, and demand a minute and laborious study of the natural features of the position in relation to the defence. No rules but of a very general character can be laid down for the guidance of engineers in such cases. We may conclude that in order to arrange the different parts of a fortification and combine them properly, a knowledge of the means which may be employed to fulfil the general condition before given, and a suitable adaptation of these parts to the natural features of the position, are necessary. The utility of permanent fortifications has been seriously called in question; but it is enough to say that Napoleon, the archduke Charles of Austria, the duke of Wellington, and others have all regarded them as of great utility and of absolute necessity for a country. It is probable that no great general has ever entertained a different opinion from them on this subject.—The selection of the points to be fortified will be influenced by the natural features of the country. As a rule, those points known as strategic points are the ones selected; that is, those points which may be considered as the principal objects to be gained by an enemy, or whose occupation would be of manifest advantage to him. The capital of a country is such a point from its importance. The effect of seizing the capital

would be to discourage the nation and to cause a large portion of the people to give up all hope of a successful defence against the enemy. A position that is the key of several important communications, like Atlanta in Georgia, where several railroads centre, or on some river, as Cairo at the junction of the Ohio and Mississippi, would be an example. In mountainous regions, the entrance of defiles, at points where several valleys branch, or at the junction of roads, are examples. Points like these are the ones to be fortified when the intention is to put the country in a state of defence against an invading force; but as in the United States there is little probability of invasion in any case except along the seacoast, the attention of American engineers has been directed to securing the principal harbors, naval stations, and commercial cities. The works for this purpose have been arranged and armed with guns and mortars of the heaviest calibre, with the design of excluding the enemy's fleet from the use of the harbor or roadstead in their vicinity. Hence these works exhibit some peculiarities of construction at variance with the general rules already laid down for permanent works. The cardinal maxim adopted by engineers is that all masonry should be masked from the distant batteries of the enemy; that no masonry should be exposed. When this rule is violated there are reasons for it which an examination of the site will explain. Earth or sand, or a mixture of them, is the material used for parapets and for the masks. An examination of fig. 1 will show that the glacis of the covered way completely masks the scarp wall of the main work from the enemy's fire. In addition to this other works are often used. In cases where, in order to get the necessary amount of fire, greatly exposed masonry has heretofore been resorted to, it is probable that wrought iron will hereafter have to be used. Experiments are in progress to ascertain the best method of substituting it for stone in those parts; and it was used to some extent in casemates by Gen. Totten, late chief engineer of the United States army. Its expense is the present chief objection.—The casemates and embrasures used to protect the artillery and the men serving it weaken the walls and limit the field of fire. Various experiments have been proposed to secure such protection without using embrasures. One of these is the project of having the gun exposed above the parapet only at the moment of firing, the recoil of the piece causing it and the carriage to descend by inclined rails or other devices to a level below the interior crest, and the piece when reloaded being raised to its former position in battery by the aid of a counterpoise attached to the gun or carriage, which has been lifted to a certain height by the gun in its descent to the lower level. Several ingenious plans have been proposed to carry out this principle. Among the first was that of Gen. De Russey, colonel of the United States engineers, who made a model showing this

principle about 1840. The best known plans, however, are the gun carriage devised by Major Moncrieff of the English militia, and that of Major King of the United States engineers. These carriages have been tested by actual experiments, and show that the principle is capable of practical application. Maj. Moncrieff's project has been suggested for sunken batteries, the gun and carriage sinking into a pit prepared for the purpose. Maj. King's is intended to apply to existing works. To complete the fortification for the defence of harbors or rivers, the fifth general condition must be extended to include a good system of torpedoedoes. (See TORPEDOES.)—All arrangements made for the defence with musketry and artillery belong to what is known as the armament. That for small arms is complete when the slopes of the parapet and the position of the banquettes are arranged. The final defence of the work depends upon the effective use of these arms. For artillery the arrangements may be barbette, embrasure, or casemate. The first is a construction by means of which the piece fires over the parapet; the second, an opening for a gun in the parapet, exposed to vertical fire; and the third, an opening protected from vertical fire. The calibre, the kind of guns or mortars, and their positions in the work, will depend upon the object of the fortification, and the kind of attack that it is exposed to.

II. TEMPORARY OR FIELD FORTIFICATIONS. These are of two kinds, those used in the defence of a position, and those used in the attack of a position or place. They might be classed as defensive and offensive works. The main objects of these works are to afford a shelter from the enemy's fire, an obstacle to the enemy's progress, and means for the assailed to use their arms with effect. The general term intrenchments is applied to all field works, and a position strengthened by them is said to be intrenched. The general principles involved in permanent fortification are applicable to these defences, the only difference being in degree. The parapet differs from the parapet represented in fig. 1 only in thickness and in resting on the natural surface of the ground instead of on a rampart. The thickness is regulated by the material used, the kind of attack, its probable duration, and the length of time at the disposal of the assailed to throw up the work. As a general rule, its thickness is one half greater than the depth of penetration of the projectile into the material used. If the projectile from a field gun at a distance of 440 yards, firing against the work, can penetrate 6 ft., the thickness must not be less than 9 ft., measured horizontally between the interior and exterior crests. The height of the interior crest above the ground within the work must not be less than 6 ft. 6 in. We assume it ordinarily to be 8 ft., and limit its greatest height to 12 ft., owing to the difficulty of throwing up a work with this relief in a reasonable length of time, with the ordinary means

at hand. Works of a greater command than this have been constructed; the length of time consumed in building these, their importance, and the many interior arrangements devised for the safety and comfort of the troops using them, cause them to approach more nearly in detail works of a permanent character; and they have been called for these reasons semi-permanent works. The ditch that surrounds the work affords the earth for the parapet, and should be wide and deep enough (not less than 12 and 6 ft.) to form a considerable obstacle to the assailants. The slopes are the same as given for the permanent work, viz.: superior slope, $\frac{1}{4}$; exterior slope, $\frac{1}{4}$; and interior slope, $\frac{1}{4}$. The sides of the ditch are not ordinarily revetted; if so, however, it is by some material of a perishable nature, as plank, timber, &c. The interior slope is revetted by sods, or some material hastily gathered for the purpose, as logs, boards, fascines, gabions, &c. The banquette is placed 4 ft. 8 in. below the interior crest, and is from 2 to 4 ft. wide. It is connected with the ground by a slope of $\frac{1}{4}$, which is sometimes replaced when interior space is needed by steps whose tread is 12 in. and rise 9 in. In laying out the plan of the work the line of the interior crest is adopted as the directing line. The plans of these works vary according to their object and site. Supposing the site level or approximately so, the relief is generally uniform throughout. Such works may be classed into three kinds: 1, those that are arranged to sweep only the ground in their front; 2, those that do the same for their flanks in addition; 3, those that are arranged to fire on all sides. A work consisting of a simple straight line, or of two faces, the rear, called the gorge, being open, is an example of the first class. This is called a redan, and is used in front of a defile, at the exit from a bridge, or for the defence of an outpost, where the attack is expected only from the front. A redan with flanks, called a lunette, is an example of the second class, and is hardly ever used alone. In this case the attack is not expected from the rear, but an assault made on the flanks would be liable to work around and carry it at the rear. Both in this case and the first, when they are used alone, the gorge is closed by palisading or a stockade. A work of a polygonal figure, without reëntering angles, in plan as a square or rectangle, arranged to fire in all directions, is used when liable to be attacked on all sides. It is called a redoubt. The ditch of a redoubt cannot be swept by the fire from the work itself; therefore the bastioned trace has been sometimes used, but the great length of time required to construct it prevents its general adoption. When these works are joined together or placed along a given front with intervals, they form either a continued line or a line with intervals. A number of redans joined by curtains is a simple case of a continued line. If the line be formed entirely of redans,

it is called a tenaille line. The usual plan of a line with intervals is to place lunettes and simple redoubts, or either, on a given front at distances apart from 250 to 500 yards, and in rear of them, opposite the intervals, redans or other field works, arranged to sweep by their fire the ground in front of the salients of the first line. In field works all accessory defences, both artificial and natural, should be freely used. On irregular sites it will not be possible to preserve the relief uniform, and the same problems for defilement will be met with as in permanent works. The only general rules that can be laid down are to lay out the principal lines so as to obtain a direct and cross fire on the approaches of the enemy, and to place them as nearly as practicable parallel to the general crests of the commanding heights, so that the enemy will have only a direct fire on them. Where the defilement would involve considerable labor in raising the interior crest to intercept the fire, traverses should be resorted to in preference.—Field works require to be simple and easy of construction. All lines and fronts should have their flanks protected by natural obstacles if possible. The relief of a work should be obtained by its position and not by the construction of embankments, and if possible the necessity of defilement should be avoided. The class of works already named will require several days and often weeks to construct. In an active campaign they are freely used, especially in the defence of defiles, the crossing of rivers, depots of supplies, intrenched camps, &c. Anticipating the movements of the enemy, time enough may be had to finish them, or at least to put them in such condition as to render them useful for defence if an attack be made. When, however, an engagement is imminent, or has begun, in the absence of such works, resort is had to what may be called hasty intrenchments for opposing the enemy's advance, sheltering troops, or strengthening the weak parts of a line. These are shelters that may be executed in a short time, say within an hour, certainly not more than three hours. They are not limited to defensive positions, but are used on the battle field itself. By excavating a trench 2 ft. wide and $1\frac{1}{4}$ ft. deep, throwing the earth to the front, building up the slope next to the trench as steep as possible by using clods of earth, sods, fallen trees, fence rails, &c., shelter will be given to two ranks, one kneeling in the trench, the other lying flat in rear of it. By placing a man at every 4 ft., the trench can be dug in 20 minutes. This trench can be widened to 4 ft. in 20 minutes more, when both ranks can enter it; in 20 minutes more it may be widened to 7 ft., increasing the thickness of the mound of earth between the men and the enemy, and allowing freedom of movement to the limbs of the soldiers. Thus it is seen that in an hour good shelter can be obtained by active troops. These are known as shelter trenches, and upon

being further strengthened from what we call rifle trenches or pits. In these the trench at bottom is 5 ft. wide and 8 ft. deep; the earth is thrown forward far enough to allow the natural surface of the ground to act as a banquette, the embankment being 4 ft. 6 in. high. These expedients have entered largely into the operations of recent wars, but in no country and at no time have they been used with greater success or more generally than in the late civil war in the United States. Whenever an army halted in the presence of the enemy they immediately began to intrench themselves, before eating or resting. The difficulty was to get them to wait until a proper line was selected. This custom has not been confined to modern times. The Roman legions intrenched their camp every night, and remains of many of their intrenched camps are yet to be seen.—The use of field works runs back to the remotest antiquity, and has ever played a most important part in the operations of war. Prominent examples are Frederick the Great's camp at Bunzelwitz, Wellington's lines at Torres Vedras, the French lines at Weissenburg, the Austrian intrenchments in front of Vienna in 1848, and the lines of field works around Vicksburg, Nashville, Petersburg, Richmond, and, most prominent of all, the city of Washington.—For the offensive works used in siege operations, see *SIEGE*.—There are numerous works on fortification, but full information may be obtained from those of Prof. D. H. Mahan, "Military Engineering: Part I., Field Fortifications, &c.; Part II., Permanent Fortifications" (2 vols. 8vo., New York, 1865-'7), and Gen. A. von Zastrow, *Geschichte der beständigen Befestigung* (8vo, Leipsic, 1854; translated into French, *Histoire de la fortification permanente*, 2 vols. 8vo, Paris, 1856).

FORT JACKSON. See **NEW ORLEANS**.

FORT MADISON, a city and the capital of Lee co., Iowa, on the Mississippi river, 12 m. above the lower rapids, and 17 m. S. W. of Burlington, on the Chicago, Burlington, and Quincy, and the Burlington and Southwestern railroads; pop. in 1850, 1,509; in 1860, 2,886; in 1870, 4,011. It is built on ground rising gradually from the river. The houses are for the most part of brick, and are surrounded by grounds tastefully arranged, and shaded by ornamental trees. The city is the site of the Iowa state prison, a limestone structure containing 318 cells, and furnished with extensive workshops. The number of convicts in 1873 was 264. The court house and county jail are substantial structures. The river is crossed by ferries. Fort Madison is a place of considerable trade, and its manufactures are important, including hardware and machinery, lumber, flour, brick, woollens, wine, &c. There are five hotels, four public halls, a public library, a theatre, and a national bank. The Fort Madison academy has an average attendance of 100 pupils. The city contains five public schools,

two weekly newspapers, and nine churches.—Fort Madison was first settled in 1832, and was incorporated as a town in 1836. It derives its name from a fort erected in 1808, and named in honor of James Madison.

FORT ROYAL, or **Fort de France**, a seaport of the French West Indies, capital of Martinique, situated on a deep and well sheltered bay on the W. side of the island; pop. about 12,000. It is defended by a fort which commands both the town and the harbor, is the residence of the French governor and of a bishop, and contains, besides the parish church and government offices, a prison, hospital barracks, and an arsenal. The streets are straight and spacious, and the houses in general well built. The town was founded in 1672. In 1839 it was almost wholly destroyed by an earthquake, in which more than 500 lives were lost.

FORT ST. DAVID, a town of India, on the Coromandel coast, in South Arcot, 3 m. N. of Cuddalore, and 12 m. S. S. W. of Pondicherry. It was formerly well fortified. The town was called Tegnapatam till 1691, when it was purchased by the East India company. It withstood a siege by the French in 1746, and from that period remained for 12 years the capital of the British possessions in this part of India. In 1758 the French under Lally besieged it again, captured it after a short resistance, and destroyed its fortifications. It is now in ruins.

FORT SCOTT, a city and the capital of Bourbon co., Kansas, on the Marmiton river, a branch of the Osage, about 100 m. S. of Leavenworth; pop. in 1860, 262; in 1870, 4,174. The Missouri River, Fort Scott, and Gulf, and the Missouri, Kansas, and Texas railroads intersect here. Bituminous coal is abundant in the surrounding country. Manufacturing industry is little developed, but there are three flouring mills, a planing mill and furniture factory, carriage and wagon factories, cement works, founding and machine shops, a castor oil factory, cement pipe works, and a barrel factory, employing in the aggregate 144 men. Two national banks have been established, with a capital of \$150,000. The city contains five public school buildings, one of which cost \$60,000, and has a normal department. One daily and two weekly newspapers are published. There are nine religious societies. Fort Scott was established as a military post in 1842, and was incorporated as a town in 1855.

FORT SMITH, a city of Sebastian co., Arkansas, on the right bank of the Arkansas river, at the head of steamboat navigation, about 180 m. W. N. W. of Little Rock, and near the boundary of the Indian territory; pop. in 1860, 1,532; in 1870, 2,227, of whom 586 were colored; in 1873, 3,500. The situation is beautiful, and commands an extensive view of the Arkansas, the land, interspersed with hills and dales, rising gradually from the river. The business portion of the city is mostly built of brick and stone. The outskirts are lined with gardens, amid which are handsome residences.

The surrounding country is rich in timber and coal. The Little Rock and Fort Smith railroad was completed in 1878 to Clarksville, 60 m. distant. There are several manufactories, including a large flour mill, a planing mill and machine shop, two breweries, and two wagon factories. There are Lutheran, Baptist, Methodist, and Catholic schools, three public schools, of which one is colored, and nine churches. Four weekly newspapers are published, two of which also issue tri-weekly editions. The United States courts for the western district of Arkansas are held here. The town was laid out in 1838 on land adjoining the reservation belonging to the government post of that name.

FORT SUMTER. See SUMTER, FORT.

FORTUNA, in Roman mythology, the goddess of chance, both happy and unhappy, called by the Etruscans *Nursia*. Among the Greeks she was known under the name of *Tyche*, as the daughter of *Oceanus*, according to *Hesiod*, and as the sister of the *Moeræ* or *Parcæ*, according to *Pindar*, and had her temples at *Smyrna* and other cities. She was worshipped in Italy in the earliest times by the Etruscans at *Volturni*, by the Latins at *Præneste*, and by the *Volsci* at *Antium*, where she had a temple, two statues, and an oracle, whose responses were highly valued. She was diversely represented as blind, with wings on her feet, which she was believed to lay aside when entering Rome, with a crescent on her head, a helmet, cornucopia, or globe in her hand, and resting on a wheel. The town of *Palestrina* is built chiefly on the site of the temple of *Fortuna*.

FORTUNATE ISLANDS. See CANARY ISLANDS.

FORTUNATUS, the title of a collection of popular tales, the earliest known publication of which took place in Augsburg in 1509, though it includes fairy lore and popular legends of an earlier period. They teach that wealth is not sufficient to secure permanent happiness, which is illustrated by its ultimately ruining *Fortunatus* and his sons, who were in possession of boundless riches and of a talisman enabling them to attain all their desires. The conception was long supposed to be of Spanish or English origin, but the Germans claim it. In 1530 appeared a new edition entitled *Fortunatus von seinem Seckel und Wunschhütlein*; and since that time numerous editions and translations have appeared in the chief European languages. It has been dramatized in German by *Hans Sachs*, and in English by *Thomas Decker*. The earliest edition is reproduced in *Simrock's Deutsche Volksbücher* (3 vols., Frankfurt, 1846), and the subject is a favorite theme of German poets, and of expounders of mediæval literature.

FORTUNE, Robert, a Scottish botanist, born in Berwickshire in 1813. He was brought up as a horticulturist, and having procured employment in the botanical gardens of Edinburgh, attended the lectures of the university professor. He was afterward employed in the botanical gardens at Chiswick, and was appointed

by the London horticultural society as collector of plants in northern China, which the peace of 1842 had just thrown open to Europeans. His "Three Years' Wanderings in the Northern Provinces of China" (2 vols. 8vo, 1847), published soon after his return, affords full information of the horticulture and agriculture of the Chinese. After superintending for several months the gardens of the apothecaries' company at Chelsea, he again departed in the latter part of 1848 for China, under the auspices of the East India company, to examine and report upon the nature and method of cultivation of the tea plant, and to collect its seeds and introduce its culture into northern India. After an absence of more than three years, he returned to England and published "Two Visits to the Tea Countries of China" (2 vols. 8vo, 1852). He soon made a third tour to the same country, the results of which were given in his "Residence among the Chinese, Inland, on the Coast, and at Sea, being the Third Visit from 1853 to 1856" (8vo, 1857). In 1857 he was employed by the United States patent office to visit China to collect the seeds of the tea shrub and of other plants, with a view to their cultivation in the United States. He proceeded from England by the overland route directly to the tea districts in the middle and northern provinces of China, where he remained until March, 1859, shipping a large quantity of seeds to the United States. He returned to England in May, and has since published "Yedo and Pekin" (London, 1863).

FORTUNY, Mariano. See supplement.

FORT WAYNE, a city and the capital of Allen co., Indiana, on an elevated plain at the confluence of the St. Mary's and St. Joseph's rivers, which here form the Maumee, and on the Wabash and Erie canal, 102 m. N. E. of Indianapolis; pop. in 1840, 2,080; in 1850, 4,282; in 1860, 10,888; in 1870, 17,718, of whom 5,041 were foreigners. Most of the business blocks and many of the residences are of brick. Among the public buildings are the court house, which cost \$80,000, and the county jail. There are three public parks, of which the principal one lies S. of the St. Mary's river. N. of the river is a trotting park. Of the five cemeteries, the largest and handsomest is Linden Wood, $1\frac{1}{4}$ m. W. of the city, containing 160 acres. The first impetus to the growth of Fort Wayne was given by the completion of the Wabash and Erie canal about 1840. Numerous plank roads were afterward built, and since 1850 a still more rapid advance has resulted from the construction of railroads, of which five intersect at this point, viz.: the Toledo, Wabash, and Western; Pittsburgh, Fort Wayne, and Chicago; Fort Wayne, Jackson, and Saginaw; Fort Wayne, Muncie, and Cincinnati; and Grand Rapids and Indiana. The buildings of the two railroads first named are extensive. All the machine work, building of cars, and repairing for the western division of the Pittsburgh, Fort Wayne, and Chi-

cago road are done here. The buildings for this work are of brick, mostly two stories high, and cover six acres. Good water power is furnished by the canal and the river, and the manufactures are important. The Fort Wayne machine works, with machine shop, foundry, car wheel shop, boiler shop, and blacksmith shop, employ 125 men. There are also 2 other machine shops, 8 flour mills, 8 planing mills and sash and door factories, 4 tanneries, 3 cabinet works, 2 manufactories of agricultural implements (reapers and mowers, threshing machines, &c.), a woollen factory employing 70 men, a hub, spoke, and bending factory, having 125 men, 3 national banks with a capital of \$750,000, and 3 insurance companies with \$555,000 capital. The city is divided into nine wards. There are efficient police and fire departments, and the streets are well paved and lighted with gas. The principal charitable institutions are the orphans' home and the city hospital. The public schools consist of a normal school, a high school, 3 grammar and 32 primary schools, which in 1872 had 55 teachers and an average attendance of 2,830 pupils; expenditure for school purposes, \$41,300, of which \$25,000 were for teachers' wages. Concordia college (Lutheran), established in 1850, had 4 professors, 148 students, and a library of 8,000 volumes. Fort Wayne college (Methodist), established in 1846, had 7 professors, 132 students, and a library of 1,600 volumes. There are a German Reformed, three Lutheran, and six Catholic parochial schools. Two daily newspapers, one tri-weekly (German), and six weekly (two German) are published. There are 15 churches.—The site of Fort Wayne was visited as early as 1700 by the French for the purpose of trading with the Indians. Prior to 1719 they established a regular trading post here, and subsequently erected Fort Miami. In December, 1760, the British built a fort on the E. bank of the St. Joseph's near its mouth. In October, 1794, Gen. Wayne erected the government post of Fort Wayne; in 1825 the town was laid out; and in 1840 the city was incorporated.

FORUM, in ancient Roman cities, an open place used for the administration of justice or the sale of goods, and for the transaction of all kinds of public business. In this respect it corresponded with the *agora* of the Greeks; but unlike this, it was oblong in form, and never square. In a Roman camp it was the open space before the tent of the general, and the word also forms a part of the name of many towns and villages. The Romans had two kinds of *fora*, the *civilia*, sometimes called *judicialia*, in which popular assemblies and courts of justice were held, and where the bankers and usurers usually had their stands; and the *venalia*, which were used exclusively for mercantile purposes. The city of Rome contained 19 of both kinds; but the *forum Romanum*, whose origin is coeval with that of the city, and which is known by the general name of the Forum, was by far the most im-

portant, notwithstanding some very magnificent ones were built under the emperors. It occupied a hollow space between the Capitoline and Palatine hills, extending in its longest diameter probably from the arch of Septimius Severus to the temple of Antoninus and Faustina. Around its four sides stood temples, basilicas, triumphal arches, and other public edifices, while within it were the *rostra* or stages from which orators addressed public assemblies, statues of illustrious Romans, columns, and trophies of war. At the *comitium* or upper end were suspended the laws of the twelve tables, and the *fasti* or calendar of all the days on which legal business could be transacted before the prætor. It is now known as the Campo Vaccino, from having been used for several centuries as a cattle market, and preserves no traces of its ancient splendor beyond a few scattered columns. A *forum judiciale* was built by Julius Cæsar, and another by Augustus, which, with the *forum Romanum*, seem to have been the only ones in Rome for the transaction of public business.

FORWARDING MERCHANT, one whose business it is to send forward goods to a distant consignee. There are in the United States persons who engage in this business almost exclusively, especially in the western cities, in which produce accumulates on its way to the east, and to which eastern goods are carried for distribution through the west. There is nothing, however, in their business which is so far peculiar to them as to be governed by peculiar laws of its own, and therefore call for especial statement. But there are two classes of persons who come under this name, or discharge the duties which it describes, and of whom more should be said. One of these consists of those who are called expressmen, and the other of common carriers, who, besides carrying goods on their own route, undertake to forward them still further. The whole business of expressmen is of comparatively recent origin; but it has already reached an immense extent and importance. It has grown out of common carriage of goods, but differs from it mainly in the fact that expressmen have no means of carriage of their own, but hire cars or vehicles, or room in them, and usually go with their parcels. It may be said, too, that they usually carry parcels only, or if larger packages, still not cargoes or large quantities of goods, as hundreds of barrels or bales, the carriage of these things being still left to common or private carriers. The principal question in relation to expressmen has been, are they still common carriers in law, and do they as such come under the strict responsibilities of common carriers? In other words, do they insure the safe carriage and delivery of all the goods against all risks "except the act of God and the public enemy"? It is now settled that they do thus insure the goods they receive throughout the whole route for which they profess to be carriers, and that they are therefore liable for any loss or injury

to them, without any proof or intimation of their negligence or default. No customer is bound to inquire by what means or by what arrangements the expressman proposes to carry his parcel. If he receives it in Portland, and undertakes, specially or by general advertisement, notice, or sign, to "express it through" (to use a common phrase) to New Orleans or San Francisco, he is responsible for its safe delivery there. —A railroad company which takes goods at one place to be carried to a distant one might be thought to come necessarily under the same rule, but it is not quite so. There is this difference between the two cases: the expressman has not, or is not known to have, any regular means of conveyance of his own for any definite portion of the distance over which he assumes to carry the goods. The owner who gives him a parcel in Portland for New Orleans has no means of knowing, and indeed no reason for supposing, that the expressman has not made similar arrangements for all the parts of his route that he has made for any part. It is indeed commonly understood that every expressman does not undertake to convey goods everywhere, but this man advertises from A to B, because he has so arranged and provided, and that man from A to C, and the other from A to D; and his advertising, or indeed his undertaking to carry to the specified place, may properly be understood as a declaration on his part that he has made sufficient preparation in that direction and to that distance. But if the man in Portland puts goods on board a railroad car to go to New York, he knows, or should know, that the railroad company will convey it a certain part of the way in their own carriage, and under the charge of their own servants, and will not and cannot do anything beyond that point except to put it safely on board of the cars of another company, who will take it to or toward New York. That is, the man in Portland knows that the railroad company will there receive the parcel as a carrier, and take it a certain distance as carrier, and will then act as a forwarding merchant for the rest of the route, sending it on in the best way they can. Here then is a change of relation, and with it a change of obligation; for the essential difference is this: a common carrier insures his goods against all risks but those arising from the act of God or the public enemy; but the forwarding merchant is liable only for his own default or neglect. If a company take a parcel in Portland, and it is lost between Boston and Worcester, no one knows how, the sender can look at once to the company that took it if they are carriers all the way, but not if they were carriers only to Boston, where their road ends, and only forwarding merchants for the rest of the route, and can show that they delivered the parcel safely and properly for further carriage. If it is known where the parcel is lost, the sender may always call on the company who had it in their possession or

under their care when it was lost. But if, as sometimes happens, it can be traced beyond the first carrier, and no negligence can be imputed to him, and no one knows what has become of it, the sender is wholly remediless unless the first carrier is carrier to the end. Whether he is so or not has been very much disputed. Cases turning on this point have been very frequent both in England and the United States, and perhaps the law may not be positively determined in either country. Perhaps it may be said that the English courts are more disposed to fix the liability of carrier to the end upon the party that first takes charge of the parcel than our own courts; but upon the whole, and resting upon the most recent adjudications, the rules of law in this matter may be summed up thus. There may be a partnership in the business of common carriage as in all others, and a railroad company may connect itself with other companies or with other carriers, and form a *quasi* partnership, the effect of which will be that each member will be liable, *in solido*, for all the rest. In that case, all the companies on the whole route are liable for a loss occurring in any part; and in particular the first company taking the parcel, or the last into whose hands it may be traced, may be made liable severally for any loss which has happened on the route. The company comes under such a liability equally by forming such a partnership and entering into such a joint business, or by advertising or indicating such a joinder in business, in any way which entitles third parties to act on the belief of it. And if such companies have a joint agent at either terminus or at any station, and this agent, with the knowledge of all, and purporting to act for all, sells a through ticket, as it is called, none of the companies thus represented can deny their joint business and joint or several liability for the whole; and if the price of the ticket is credited by the seller to all the companies and is divided among them, this constitutes conclusive evidence that each of them undertakes to be a carrier, with a responsibility as such, through the route. But the mere fact that a parcel directed to a distant place is received at a station, and there paid for for the whole route, does not of itself make any carrier for a part of the distance liable as carrier beyond that part. The test of the liability in every case is, what did the party undertake to be and to do? If he said he would carry all the way, he is liable as carrier all the way. If he said he would carry a part of the way and then send it on, he is only liable accordingly. And taking all the facts into consideration, which of these bargains was it that the railroad company made with the sender?—With this principle to guide us, we may return to expressmen. A person living at Albany wishes to send by express a parcel to New Bedford. He gives it to an expressman of Albany, who takes it to New York, and there gives it to the express-

man for Boston, who pays the Albany man his fee for bringing it to New York, and takes it to Boston. The expressman between Boston and New Bedford pays the New York man what he paid, and also the fare from New York to Boston, and takes it to New Bedford; and the consignee when he takes the parcel pays the man who gives it to him all he has paid, and in addition his fare from Boston to New Bedford. Now, if the parcel did not arrive safely, but was lost somewhere on the route, is each one of these expressmen liable for the whole? We should say this must depend upon what each one undertakes to do. If the Albany man advertises that he takes goods to New Bedford, he is liable as far as New Bedford as carrier. If he advertises that he carries parcels to Boston, he is so liable to that place; if only to New York, he is liable as carrier only to New York, and as forwarding merchant at New York, and there his liability ends; and so of all the rest. Expressmen now not uncommonly insert in their bills of lading or receipts which they give their customers a clause to this effect: "This company is responsible only as forwarders, and only for the negligence or other default of persons employed by them; and this is a part of our contract with all whose goods we carry." But the law is now settled that while a common carrier may make a valid special bargain with his customer, a mere notice or declaration upon a ticket or bill of lading does not constitute such a bargain, unless assented to by the customer.

FOSCARI, Francesco, doge of Venice, born about 1373, died Oct. 31, 1457. Elected doge in 1423, the whole period in which he governed the republic was one of war and tumult. The sultan Amurath II. laying siege to Salonica, Foscari despatched troops thither, who repelled the Mussulmans. He then engaged in hostilities with the duke of Milan, Filippo Maria Visconti, and subjected to the republic the territories of Brescia, Bergamo, and Cremona, making the Adda the boundary of the Venetian dominion. The war was soon renewed with various success, nearly all the Italian cities taking part in it; but the doge, supported by Cosmo de' Medici and by Francesco Sforza, marquis of Ancona, still further extended his power by a treaty concluded in 1441. New wars, involving extensive leagues though little bloodshed, followed soon after; but in his old age Foscari had made peace with all the enemies of Venice, including Mohammed II., the successor of Amurath, when Jacopo, the last survivor of his four sons, was brought a second time before the council of ten, falsely charged with the assassination of its chief. The tribunal, jealous of the power and popularity of the doge, condemned his son first to torture and then to exile in Candia. The young Foscari, whose mind was disordered by suffering, wishing after long banishment to see his country again at whatever peril, effected his return thither, but being condemned again, had scarce-

ly reached the place of exile when he died. This event is the subject of Byron's tragedy, "The Two Foscari." For the old doge one other humiliation remained. He had twice asked leave to resign his office, but the council had obliged him to retain it. He was now deposed, through the machinations of his enemies, and died a few days after in a spasm as he heard the bells of St. Mark announce to Venice the election of a new ruler.

FOSCOLO, Niccolò Ugo, an Italian poet and miscellaneous writer, born in the island of Zante, of a Venetian family, Jan. 26, 1777, died at Turnham Green, near London, Sept. 14, 1827. He was educated in Venice, and at the university of Padua. His first tragedy, *Tieste*, was produced at Venice in 1797, and was so unsatisfactory to the author that he himself published the severest criticism of it. When Venice was surrendered by Bonaparte to Austria he retired with other patriots to Milan, and wrote a political romance called *Lettere di due amanti*, afterward republished under the title of *Le ultime lettere di Jacopo Ortis*. In 1799 he volunteered in the Italian contingent of the French army, took part in the defence of Genoa under Masséna, and returned to Milan. When in 1802 Napoleon assembled the *consulta* of Italian deputies at Lyons to provide a new constitution for the Cisalpine republic, Foscolo was appointed to report upon the state of the country; and in an elaborate discourse he contrasted the abuses of the military government which had been established with the free government which had been promised. In 1808 he was appointed professor of Italian eloquence in the university of Pavia, but the political independence evinced in his lectures soon caused his chair to be suppressed. At this period he published his beautiful lyric poem *I sepolcri*, his tragedy of *Ajace*, and an Italian translation of Sterne's "Sentimental Journey." On the fall of Napoleon he retired to Switzerland, and in 1816 to England. He wrote for the reviews articles on Dante, Petrarch, Boccaccio, and other Italian authors, delivered lectures on Italian literature, published an "Essay on Petrarch" in a separate volume (1823), and edited the *Divina Commedia* of Dante (1825). His *Epistolario* (3 vols.) and a new edition of his *Poesie* were published at Florence in 1856. His remains have been removed from Chiswick, England, to the church of Santa Croce, Florence.

FOSSANO, a town of Piedmont, Italy, on the left bank of the Stura, in the province and 13 m. N. N. E. of the city of Coni, and 34 m. S. by E. of Turin; pop. about 7,000. It is an antique, dismal, but regularly planned town, built on a high hill, surrounded by walls, and defended by a strong fortress which commands the valley of the Stura and the road into France by the Col d'Argentière. The houses are built upon arches over the footpaths, and the passages in many places are so low that a tall person can hardly walk upright in them. It

is the seat of a bishop, and has an academy of science and art, a veterinary school, a philharmonic academy, and a theatre. It was a walled place in the 13th century, was frequently attacked by the counts of Asti and Saluzzo, and early in the 14th century put under the protection of Philip of Savoy. It figured in the wars between Charles V. and Francis I. It was taken by the French in 1796, and in 1799 the French under Championnet were defeated here by the Austrians under Melas.

FOSSIL (Lat. *fossilia*, dug up), a term formerly applied to all mineral substances, but now used to designate only the remains of organic bodies found in geological formations. The general subject will be treated under the title **PALÆONTOLOGY**, and the more important fossil animals under their respective names.

FOSSIL FOOTPRINTS, or *ichnolites* (Gr. *ἰχνορ*, a track, and *λίθος*, a stone), in geology, impressions originally made by animals in clay or in sand, and preserved in the shale or sandstone rock resulting from the solidification of those materials. Under these names have been included markings of various forms in rocks of very different geological ages. Some of these markings, though doubtless made by animals, are not the impressions of their feet, but have been produced wholly or in part by their tails or their carapaces; and to these, although truly ichnolites or track-stones, the name of fossil footprints does not therefore apply. It will, however, be convenient to include under this head all the markings of animals found in rocks. Recent impressions of the feet of quadrupeds, birds, and reptiles, and the markings made by crustaceans, mollusks, and worms, may be studied on the shores of tidal waters, where successive layers of mud and sand preserve them in the accumulating sediments; and the careful study of these by Dawson has thrown much light on some of the markings found in earlier rocks. To begin with the ichnolites found in rocks of cenozoic or tertiary age, we may notice those in the eocene of the basin of Paris, where, in the marls which are interstratified with the gypsum beds which there abound, are found a great variety of markings. Prominent among these are the trilobed footprints of several species of *palæotherium*, a large pachyderm allied to the modern tapir, besides those of *anoplotherium*, an animal more nearly allied to the ruminants, and of certain carnivorous mammals. In addition to these are tracks of various land and fresh-water tortoises, of a gigantic bird, and of crocodiles, iguanas, and great batrachians or frog-like animals. The bones of many of the mammals whose tracks are here met with occur in the gypsum beds which are interstratified with the marls; but there were evidently numerous species of which the bones have not been discovered, and which are consequently known to us only by their foot marks. The whole condition of things here shows that there then existed numerous small lakes of fresh water, the shores

of which were frequented by great numbers of pachyderms of numerous species, and by beasts of prey which occasionally devoured them, the tooth marks of the carnivora being found on the bones of the former. It will thus be seen that it is only in rare localities that the conditions necessary for the formation and preservation of these foot marks occur, and it is a fortunate chance which exposes them for our inspection. It was not till 1859 that these were discovered in the neighborhood of Paris.—In the mesozoic period the footprints of the trias or new red sandstone are remarkable for their number and variety, and also for the interest which attaches to the history of their discovery in the valley of the Connecticut river, where they are very abundant. Attention was first called to these so-called bird tracks by Mr. Dexter Marsh, and they were subsequently studied by Dr. James Deane and by Prof. Edward Hitchcock, who after a careful examination of them concluded that they were truly the footprints of birds; and they were therefore called by him *ornithichnites* or bird tracks. He ascertained their existence in numerous localities, and showed that they occur at intervals through a thickness of 1,000 ft. of sandstones and shales. He further remarked that although the beds bearing the tracks are now inclined at angles of from 5° to 30°, they must have been horizontal at the time the impressions were made; and showed that their occurrence throughout so great a thickness of strata could only be accounted for by supposing that the surface was subsiding during the deposition of these rocks. Some of these tracks were of gigantic size, one of them measuring 10 by 16 in., and recurring at intervals of from 4 to 6 ft. along the surface of the rocky bed; these distances indicating the length of the strides made by the animal. A careful study of these markings during many years convinced Prof. Hitchcock that many of them were made not by birds, but by batrachians or huge frog-like animals; and in an elaborate report by him, published by the state of Massachusetts in 1856, he showed that the ichnolites of the red sandstone had been found in not fewer than 38 localities, extending over a length of 90 m., with a breadth of 2 or 3 m., in the Connecticut valley. The markings known to him were referred to as many as 119 species of animals, including quadrupeds, birds, lizards, batrachians, tortoises, fishes, crustaceans, insects, and worms. While most of these markings were made on land, others were apparently produced by animals like fishes, swimming near the bottom. The surfaces of many of the beds bear the marks of waves or ripples, and others are distinctly marked by rain drops. The collection of these ichnolites made by Prof. Hitchcock, and now in the museum of Amherst college, is very great, and shows more than 8,000 individual tracks. A few remains of bones and coprolites have been found in the sandstones

of this formation, but they have not thrown much light upon the animals producing the tracks. Footprints have since been met with in the sandstones of the same formation in New Jersey, and in their probable equivalents, the lower triassic sandstones of Lancashire and Cheshire in England, and also at Hildburghausen in Saxony. These European footprints have a rude resemblance to the human hand, and were for some time regarded as the marks of an unknown quadruped, to which was given the name of *cheirotherium*, a supposed marsupial allied to the kangaroo. The tracks are of considerable dimensions, and those of the hind and fore feet differ greatly in size. They have since, however, been referred with greater probability to the *labyrinthodon*, an animal allied to the crocodiles, to which may be due some of the footprints of the Connecticut valley. But besides these five-toed and four-footed animals, were those which made the three-toed biped impressions at first regarded as the tracks of birds, and very abundant in the Connecticut sandstones. Prof. Hitchcock finally recognized the fact that some of these animals had huge tails, which had left their impressions, and smaller fore feet or paws, which they sometimes put to the ground; and he then referred them to a kind of bird-like lizards. More recent studies of the fossil remains of these animals, which have been carefully made by various naturalists, and especially by Cope, have made us acquainted with that curious class of animals, the dinosaurs. These creatures constituted numerous genera and species, some of gigantic size, others comparatively small; some feeding on plants, and others carnivorous; but all remarkable for presenting a higher type of reptilian organization than any now existing, and approaching in some respects to the birds and in others to the mammalia. Among the vegetable feeders of this group was *hadrosauros*, a gigantic animal, 20 ft. or more in height, with huge bird-like legs and feet, a lizard-like tail, a diminutive head, and small fore feet or hands, feeding on plants; while *lialaps* was an equally huge carnivorous animal of somewhat similar organization. The animals which made the so-called bird tracks in the sandstones of the Connecticut valley were probably similar to these.—If we go backward to the palæozoic period, we find in its upper portion, in the rocks of the coal formation in Pennsylvania, footprints which probably belong to an air-breathing frog-like animal related to the *labyrinthodon* of the mesozoic. Footprints, apparently of batrachian reptiles, are also found in the carboniferous formation of Nova Scotia. These, so far as we know, are the oldest air-breathers, and the remains of animals of this kind which abound in the rocks of this region have been described and figured by Dawson. In the great series of palæozoic rocks beneath the coal, comprising the Devonian, Silurian, and Cambrian, we have numerous ichnolites,

but, so far as we know, belonging, unlike those which we have described, solely to fishes or to invertebrate animals. The sandstones at the base of the coal in Nova Scotia are marked with the tracks of a crustacean allied to the *limulus* or king crab; and to an animal of that kind are ascribed those curious markings found in the beds of the Potsdam sandstone at several localities in the St. Lawrence valley near Montreal, to which the name of *protichnites* has been given. These tracks, at first supposed to be the footprints of a large tortoise-like animal, show the presence of several pairs of walking feet and of a flexible tail. In the same sandstone beds are singular ladder-like markings, which have been called *climactichnites*. Dr. Dawson has in this connection studied carefully the habits of the king crab, and has shown that when walking on the sands it produces impressions very like *protichnites*, and when using its swimming feet, markings like *climactichnites* were the result. In the Chazy and Clinton divisions of the lower palæozoic in New York and in Canada are curious bilobate markings, which were supposed to be the impressions of a marine plant, and received the name of *rusophycus*, but according to Dawson are really casts of burrows, connected with footprints consisting of a double series of transverse markings, so that a comparison of them with the trails and burrows of *limulus* justifies the conclusion that they were produced by trilobites. To these markings he has given the name of *rusichnites*, and has recognized the existence of similar forms in the carboniferous, which he refers to the trilobites of the genus *Phillipsia* found in these beds. The curious markings which have been called *cruziana*, from the lower Cambrian rocks, were probably produced by crustaceans not dissimilar to those which made *rusichnites*. Curious parallel notched grooves in pairs, found in the carboniferous of Nova Scotia, have been described and figured by Dawson under the name of *diplichnites*, and referred by him, with great probability, to fishes having pectoral or ventral fins armed with spines; while in rocks of the same age and still older, down to the base of the Cambrian, are numerous grooved and striated markings, some of which may have been produced by the feet or spinous tails of swimming animals. Other markings are with probability ascribed to *lingula*, which, as Prof. Morse has shown, crawls in a worm-like manner over the surface; while others still are perhaps produced by the trailing of seaweeds drifting with tides or currents. Certain markings of this kind have been regarded as impressions of the stems of plants, and, occurring in the oldest Cambrian rocks, have received the name of *eophyton*. According to Dawson, however, they are more probably the grooves produced by swimming crustaceans; and he includes under the name of *raddichnites* all those rod-like markings. Various imitative markings are met with in rocks,

which are probably not due to any organic bodies. Such are the rill marks produced by running water on the surface of soft argillaceous layers, which sometimes simulate fronds of ferns or seaweeds, or the tracks of worms.—The literature of this subject is considerable, and, as will be seen from the facts already given, the study of ichnolites is one of much geological interest. Besides the publications of Hitchcock, see Lyell's "Student's Manual of Geology," and a paper on the subject by Dawson in the "American Journal of Science" for January, 1873.

FOSSOMBRONE (anc. *Forum Sempronii*), a town of central Italy, in the province of Pesaro ed Urbino, 9 m. E. S. E. of Urbino; pop. about 10,000. It is situated on the road from Fano to Rome, in a narrow valley on the Metauro. It is the seat of a bishop, and has a cathedral with many ancient inscriptions, and an old castle. The most important branch of industry is silk culture. Near here Hasdrubal was defeated by the Romans in 207 B. C. The town was destroyed by the Goths and again by the Lombards, but rebuilt by the Malatestas, who in the 14th century sold it to the duke of Urbino.

FOSTER, a N. E. county of Dakota, intersected by the Shesenne, a branch of Red river; area about 1,700 sq. m. It has been recently formed, and is not included in the census of 1870. The Dakota or James river crosses the S. W. corner, and there are several small lakes.

FOSTER, Birket, an English artist, born at North Shields in 1812. At the age of 16 he was placed with Mr. Landells, a wood engraver, by whom he was advised to turn his attention to drawing rather than engraving. His carvings on wood, especially of landscapes and forest scenes, are among the best modern productions in that department of art. For some years he has successfully devoted himself to painting in water colors, but without wholly abandoning drawing upon wood for engravers.

FOSTER, James, an English dissenting minister, born in Exeter, Sept. 16, 1697, died Nov. 5, 1753. He was educated in his native city, began to preach in 1718, and after removing from Devonshire to Melbourne, and thence to Ashwick, became pastor in the Barbican, London, in 1724, was afterward lecturer at the Old Jewry, and in 1744 minister at Pinner's hall. His reputation for eloquence was such that persons of every rank flocked to hear him. Besides many sermons, he published an "Essay on Fundamentals, especially the Trinity" (1720); "Defence of the Usefulness, Truth, and Excellency of the Christian Religion" (1731); and "Discourses on the Principal Branches of Natural Religion and Social Virtue" (London, 1749-'52).

FOSTER, John, an English essayist, born in Halifax, Yorkshire, Sept. 17, 1770, died at Stapleton, near Bristol, Oct. 15, 1843. In early life he was a weaver, but at the age of 17, having united with the Baptist church, he resolved

to devote himself to the ministry, and finished his studies at the Baptist college in Bristol. He commenced his career as a preacher at New-castle-on-Tyne in 1792, and afterward went to Dublin, and endeavored unsuccessfully to establish himself either as a preacher or schoolmaster. In 1797 he went to a Baptist chapel in Chichester, and thence successively to Downend in 1800, and to Frome in 1804; but though his preaching was powerful, it made little or no impression on the popular mind. While at Frome he first published his celebrated "Essays," and also became the principal contributor to the "Eclectic Review," the articles for which (185 in number) formed his almost exclusive literary labor for 13 years. In 1817 he returned to Downend, where he wrote his "Essay on the Evils of Popular Ignorance," in which he gives an appalling description of the barbarism prevailing in the lower classes of the English population. His health failing, he then employed himself chiefly in preparing works for the press, though preaching at intervals until his death. He was a profound thinker and a powerful writer. His remaining books are: "Contributions, Biographical, Literary, and Philosophical, to the Eclectic Review" (2 vols. 8vo, 1840); "Lectures delivered at Broadmead chapel, Bristol" (1st series, 1844; 2d series, 1847); and "Introductory Essay to Doddridge's Rise and Progress" (1847). The "Life and Correspondence of Foster" (2 vols. 8vo), edited by J. E. Ryland, was published in 1846.

FOSTER, John Wells, an American geologist and archaeologist, born at Brimfield, Mass., in 1815, died in Chicago, June 29, 1873. He graduated at Wesleyan university, Middletown, Conn., in 1835, and one year later removed to Zanesville, Ohio, where he was admitted to the bar. He assisted in the geological survey of the state of Ohio, begun in 1837, and made a report on the central district, with a detailed section of the carboniferous limestone near Columbus, to the uppermost bed of coal near Wheeling. This was the first section ever made through the Ohio coal field. In 1845 he visited the Lake Superior copper region in the interest of several mining companies, and two years later was an assistant in the government survey of that territory. He was associated in this work with Prof. J. D. Whitney, and after 1849 the completion of the survey was left to them. "Foster and Whitney's Report on the Lake Superior Region," published by congress, is still the highest authority on this subject. He subsequently resided in Massachusetts a few years, and in 1855 was a candidate for congress in the 10th district. In 1858 he removed to Chicago. During his geological expeditions he collected a vast amount of matter not strictly pertinent to the task in hand, which he compiled and published under the title of "The Mississippi Valley" (8vo, Chicago and London, 1869). He also spent much time in studying the mounds and other evidences of ancient races in the Mississippi valley, and the result

of his discoveries and speculations was given in his "Pre-Historic Races of the United States" (Chicago, 1873). He was a frequent contributor of scientific papers to periodical literature, and published several monographs on American ethnology and antiquities.

FOSTER, Randolph S., D.D., an American clergyman, born at Williamsburg, Ohio, Feb. 20, 1820. He was educated at Augusta college, Kentucky, and in 1837 entered the itinerant ministry of the Methodist Episcopal church in connection with the Ohio conference. From 1837 to 1850 he was pastor of churches in Hillsboro, Portsmouth, Lancaster, Springfield, and Cincinnati, and from 1850 to 1857 in New York and Brooklyn. In 1857 he was elected president of the Northwestern university, Evanston, Ill. Three years later he resumed the pastorate, and was stationed in New York and Sing Sing. The general conference of 1868 appointed him delegate to the British Wesleyan conference of England, and during the same year he was elected professor of systematic theology in Drew theological seminary, Madison, N. J. In 1870 he was appointed president of this institution, retaining the chair of theology. In 1872 he was elected bishop of the M. E. church, and soon after was chosen to make an episcopal visitation in Norway, Sweden, Denmark, Germany, Switzerland, Italy, and South America. He has published the following works: "Objections to Calvinism" (12mo, Cincinnati, 1849); "Christian Purity" (revised ed., 12mo, New York, 1869); "Ministry for the Times" (18mo, New York, 1855); and "Theism," in the "Ingham Lectures" (12mo, 1872).

FOSTER, Stephen Collins, an American ballad composer, born in Pittsburgh, Pa., July 4, 1826, died in New York, Jan. 13, 1864. Early in life he evinced a fondness for music, learned unaided to play on several instruments, and, having a good voice, delighted to sing songs of his own composition. In 1842, while he was a merchant's clerk in Cincinnati, his song "Open thy Lattice, Love" was published in Baltimore, and was very favorably received. It was followed by "Old Uncle Ned" and "O Susanna," written for the negro minstrels, which achieved such popularity that he determined to devote himself thenceforth to music alone. He wrote in rapid succession a number of negro melodies, among which were "Louisiana Belle," "Camptown Races," "My old Kentucky Home," "Massa's in the cold, cold Ground," "Nelly Bly," "O Boys, Carry me 'Long," "Old Folks at Home," and many others. These became familiar not only throughout the United States but in many distant lands, and won for him a reputation as a composer of simple melodies unsurpassed in his day. Between 300,000 and 400,000 copies of "The Old Folks at Home" were sold, and others attained an almost equal popularity. During the last years of his life he dropped the negro dialect and wrote many songs of sentiment, such as "Come where my Love lies

Dreaming," "Willie, we have Missed You," "Jennie with the Light Brown Hair," "Farewell, my Little Dear," "O Comrades, Fill no Glass for Me," "Come with thy Sweet Voice again," and "Old Dog Tray." Besides a critical knowledge of music, Foster possessed a general and extensive intellectual culture. He composed both the music and the words of most of his songs, of which he published over 100. His ballads have been translated into many foreign languages and published with his music, which is marked by a sweetness and an indefinable grace and tenderness which everywhere reaches the popular heart.

FOTHERINGAY, a parish and village of Northamptonshire, England, on the river Nene, 27 m. N. E. of Northampton. Its famous castle, the birthplace of Richard III., and the scene of the imprisonment, trial, and execution of Mary, queen of Scots, was founded in the reign of the Conqueror, and pulled down by James I., soon after his accession to the English throne. The village contains a handsome church, in which were buried Edward and Richard, dukes of York, the former slain at Agincourt and the latter at Wakefield.

FOUCAULT, Léon, a French natural philosopher, born in Paris, Sept. 18, 1819, died Feb. 11, 1868. While studying medicine he was impressed by the discoveries of Daguerre, and turned his attention exclusively to optics. He rapidly acquired proficiency in this branch of natural philosophy, and in 1844 invented an electric lamp, which has been adopted by natural philosophers for physical experiments, and used as a means of lighting large factories or yards. With Hippolyte Fizeau he made a series of delicate experiments upon the phenomena of light. He solved a problem which had attracted the attention of Wheatstone, Arago, and many others, demonstrating that the velocity of light differs materially while passing through a vacuum or through transparent bodies. He was no less successful in mechanics than he had been in optics. By means of the pendulum he gave a new and striking demonstration of the rotatory motion of the earth. The gyroscope, another instrument with which he experimented, not only affords new indication of the earth's rotation, and serves to measure it, but furnishes a means of determining astronomical positions without observation of the heavens. (See *GYROSCOPE*.) Foucault was rewarded for his labors by an appointment to an important post in the observatory at Paris, and received in 1855 the Copley medal of the royal society.

FOUCHÉ, Joseph, a French revolutionist and minister of police, born at La Martinière, near Nantes, May 29, 1763, died in Trieste, Dec. 25, 1820. He was sent to Paris to study theology, but without taking orders became professor of philosophy in Arras and other towns, and in 1788 was placed at the head of the college of Nantes. He afterward became an advocate, founded a republican association in Nantes,

was chosen in 1792 member of the national convention, voted for the immediate execution of Louis XVI., and in 1793 proceeded to Lyons with Collot d'Herbois, charged with the execution of the decree issued by the convention against that city, and shared in the violent measures and wholesale executions carried out there. After his return to Paris he was elected president of the Jacobin club (June 4, 1794). His influence and opposition gave umbrage to Robespierre, who caused him to be expelled from the club; but he rejoined it after the execution of Robespierre (July 28, 1794), upon whom he now endeavored to throw all the odium of his violent proceedings at Lyons. But he was denounced as a terrorist, driven from the convention (Aug. 9, 1795), and placed under arrest, but restored to liberty by the amnesty of Oct. 26, 1795. He afterward ingratiated himself with Barras, the president of the directory, by betraying to him the movements of Babeuf. The latter was guillotined in 1797, and Fouché was rewarded with a large interest in the contracts for the army, and in September, 1798, was made minister to the Cisalpine republic. In the beginning of 1799 he was sent in the same capacity to Holland, but was soon called to Paris to enter upon the duties of minister of police. He adopted rigorous measures against political agitators, without distinction of party, coöperated in the *coup d'état* of the 18th Brumaire, and strengthened Bonaparte's position by his vigilance in detecting royalist and Jacobin conspiracies; but the first consul, who distrusted his minister, discarded him as soon as the apparent return of tranquillity rendered it practicable to dispense with his services, the office being abolished (September, 1802). He was made a senator, a post which yielded him about \$13,000 annually, and Napoleon rewarded him also with half of the reserve fund in the treasury of the police, which amounted to nearly \$250,000. In 1804, when Napoleon's position became more complicated, Fouché was again employed. He opposed the execution of the duke d'Enghien, and said to Napoleon, "It is more than a crime, it is a political fault;" a saying which, in the form "It is worse than a crime, it is a blunder," has become proverbial, and has been generally attributed to Talleyrand. After the establishment of the empire, Fouché was formally reinstalled as minister of police (July 10, 1804), and under his administration tranquillity and order were secured at home, while Napoleon was engaged in fighting his battles abroad. In 1809 he received the title of duke of Otranto, with a large pension from the revenues of the kingdom of Naples. In the same year, while the minister of the interior Crétet was sick, Fouché managed his department along with his own; and when the English landed on the island of Walcheren, he caused the whole national guard of France to be put in motion. In the following year he opened unauthorized nego-

tiations with the court of St. James, and was dismissed (June 5). Savary was appointed minister of police, and the governorship of Rome was assigned to Fouché, as a sort of honorable exile. He did not go to Rome, but was compelled to leave France on his refusing to surrender certain autograph letters of Napoleon and other important documents, and was only permitted to come back on condition of giving them up. Napoleon began to fear the intrigues of Fouché, and kept him out of France by calling him to Dresden, and sending him afterward to Illyria as governor, and subsequently to Rome. In January, 1814, he wrote to the emperor from Rome, recommending the adoption of a more conciliatory policy. Returning to France in the spring, he announced at Lyons and at Avignon the approaching fall of Napoleon, and entered Paris two days before the count d'Artois. On April 28 he wrote again to Napoleon, urging him to leave Elba for the United States. At the same time he put himself in communication with the Bourbons. They suspected him, however, and on Napoleon's return from Elba issued an order for his arrest; but he contrived to make his escape, and became for the third time Napoleon's minister of police, while he was at the same time Talleyrand's correspondent, the tool of the court of *émigrés* at Ghent, and the bosom friend of the liberal deputies in the chamber. After the battle of Waterloo he sent for Dupont de l'Eure, Lafayette, and others, and made use of their republican feelings to precipitate the overthrow of the emperor; and after his master's final abdication he became the leader of the provisional government (June 22, 1815). He was appointed for the fourth time minister of police by Louis XVIII. (July 6), but, placed between the opposition of the extreme republicans and the extreme royalists, his position became intolerable. He presented to the king two reports on the disturbed state of France, which created a great sensation, and which are the best of his political writings. He resigned the ministry Sept. 19, and was appointed ambassador at Dresden, but was deprived of that office by the law of Jan. 12, 1816, which affected all who had voted for the death of Louis XVI. From Dresden he removed to Prague, where he spent about two years; and having become in 1818 a naturalized subject of Austria, he resided for some time in Linz, and for the rest of his life in Trieste.—See Count Martel's *Étude sur Fouché et sur le communisme dans la pratique en 1794* (Paris, 1873).

FOUGÈRES, a town of France, in the department of Ille-et-Vilaine, on a hill near the Nancou, 27 m. N. E. of Rennes; pop. in 1866, 9,580. It is the seat of a subprefecture, a court of primary jurisdiction, and a communal college, and has manufactories of sail cloth and hempen fabrics, flannels, hats, and leather. It was anciently fortified, and was considered

one of the keys of Brittany until that province was united with the crown of France.

FOULD, Achille, a French statesman and financier, of Jewish parentage, born at Paris, Nov. 17, 1800, died at Tarbes, Oct. 5, 1867. His father was a banker of great wealth, and he enjoyed an unusually careful and elaborate education, which was completed by extensive travel in Europe and the East. He entered prominently into political life in 1842, when he was chosen to represent Tarbes in the chamber of deputies. In that body he at once took a high rank as an economist and financier, and confined himself almost entirely to this department of political action. Under the presidency of Louis Napoleon he was made minister of finance, and although disagreements with the president caused him twice to retire from the office, he was each time re-appointed. On the establishment of the empire, Napoleon made him a senator, and shortly afterward appointed him minister of state and of the imperial household. To him were intrusted the management and preparation of the universal exhibition of 1855, and the direction of the works on the new portion of the Louvre (1853-7). On Nov. 12, 1861, he was again made minister of finance, and held office until January, 1867, when he resigned in consequence of the imperial decree of the 19th of that month, making important changes in the administration of the government. He was the author of several pamphlets on financial questions.

FOULIS, Robert, a Scottish printer, born in Glasgow, April 20, 1707, died in Edinburgh in 1776. He was a barber's apprentice, but falling under the notice of Dr. Hutcheson, professor of moral philosophy at Glasgow university, was encouraged to perfect his education and become a printer and bookseller. In company with his brother **ANDREW** (born Nov. 23, 1712, died Sept. 18, 1775) he made journeys to England and the continent during the summers in connection with his new business, and employed his winters in teaching. In 1739 he opened a shop in Glasgow, and in the following year commenced publishing. In 1743 he was appointed printer to the university, and afterward took Andrew into partnership. Their editions were remarkable for correctness and elegance, those of the Greek and Latin classics ranking with the best of the famous Aldine series. The Foulis edition of Demetrius Phalerus *De Elocutione* (1743) is thought to be the first Greek work published in Glasgow. Among the most valuable productions of this press were: Horace (12mo, 1744), the sheets of which were hung up in the university with the offer of a reward for the discovery of any error in them; Homer (4 vols. fol., 1756-'8); Thucydides, in Greek and Latin (8 vols. 12mo, 1759); Herodotus, in Greek and Latin (9 vols. 12mo, 1761); Xenophon, in Greek and Latin (12 vols. 12mo, 1762-'7); Gray's poems, Pope's works, &c. The two brothers acquired in

time an ample fortune, which they lost by an unsuccessful attempt to establish at Glasgow an academy of painting and sculpture.

FOUNDERY. See **CASTING**.

FOUNDLING HOSPITAL, a public institution for the reception and support of deserted children. Some of the nations of antiquity were notorious for their disregard of the promptings of humanity in the treatment of foundlings. Their wisest legislators and philosophers considered infanticide justifiable under certain circumstances, and Lycurgus, Solon, Plato, and Numa condemned to death all weak or deformed children. But infanticide was punished by the ancient Egyptians, the guilty parent being compelled to pass three days and nights with the corpse of the child fastened to his neck. The laws of the Persians and the Jews also protected helpless children. In Thebes both child murder and exposure of children were forbidden. At Athens children were commonly exposed in the gymnasium called Cynosarges, and in Rome at the *columna lactaria*, a pillar which stood in one of the public market places. The state assigned foundlings as property to those who would adopt them; and those not thus adopted were educated at the public expense. It appears that Athens and Rome had public foundling hospitals at an early period, and the appellation of *Βρεφοκομείον* is believed to have had reference to that in the Cynosarges of the former city, while Rome is supposed to have possessed an establishment of the same kind at the *columna lactaria*. But most foundlings were left at the mercy of those who found them. The exposure of children became so common, that the classic historians speak with admiration of the nations who abstained from it. Strabo praises the Egyptians for their humane laws, and Ælian the Thebans for their restrictive regulations on the subject; while Tacitus mentions as a circumstance deviating from the practice of the Romans, that the old Germans and the Jews considered infanticide a crime. Endeavors to restrain the cruel practice of exposing children are said to have been made in the early days of Rome; Romulus prohibited the murder of sons and of first-born daughters. But as the population increased and the public morals declined, those who had more children than they wanted exposed some of them. Ornaments and trinkets were deposited in many instances with the children, partly with a view of enticing the people to take care of them, and partly to facilitate a future identification. Imperial Rome early afforded assistance to abandoned children. Augustus offered 2,000 sesterces to citizens who would take charge of orphans. Livia and Faustina adopted a number of deserted girls. Trajan gave alimentary pensions, and had the foundlings cared for under the name of children of the state. The first Christian emperors did not venture to punish the exposure of children, but Constantine inflicted the penalties of parricide upon fathers guilty of taking the life of their children,

and called exposure also a kind of murder. He deprived parents of all hope of being able to recover the children, and decreed that parents who were too poor to educate their children should receive pecuniary assistance. But the practice of exposure was nevertheless continued for a long time after, and was not completely prohibited till the time of Valentinian, Valens, and Gratian, in the latter part of the 4th century. The emperor Justinian passed a law in 529 which declared foundlings to be free, and forbade those by whom they were received and educated to treat them and detain them as slaves. The public institutions which are believed to have existed for the reception of foundlings in Rome in the 6th century are called by Justinian *brephotrophia*, in imitation of the Greek institutions, but nothing is known about their regulation and organization. Establishments for foundlings are said to have existed in the 7th century in Anjou, and about the same time at Treves, both in the Frankish dominions. The capitularies of Charlemagne refer to foundling hospitals as distinct institutions. In Milan an institution was founded about 787 by an archpriest named Dathius, to prevent infanticide. Of the prevalence of this crime he gives a very pathetic account in the letter of foundation, which has been published by Muratori. The mothers of children (mostly illegitimate) carried to this establishment strewed salt between the swaddling clothes, to denote that the infant had not been baptized. The foundlings were suckled by hired nurses, taught some handicraft, and at the age of seven discharged as free-born. This last regulation was probably made by Dathius, to guard against the custom by which the foundlings became the property of those who received and educated them, unless they were demanded back by their parents within ten days. In 1070 Olivier de la Traie founded at Montpellier a charitable order, whose members called themselves *hospitalarii Sancti Spiritus*, and devoted themselves to the assistance of the poor, and of foundlings and orphans. A separate foundling hospital for 600 children, under the name of hospital of the Holy Ghost, was founded in the city in 1180 by a member of that order, the count Guy of Montpellier, which was sanctioned by Pope Innocent III. in 1198. During the 18th century foundling hospitals were established at Rome, and at Eimbeck in Germany. The magnificent foundling hospital at Florence, called at present *ospedale degli innocenti*, was founded about 1316; kindred institutions were established in Paris in 1362, and in Venice in 1380. The hospital at Nuremberg, founded in 1381, had a lying-in department, and made it obligatory on the children to refund the expense of their education. The hospital of the Holy Ghost at Marseilles, founded after that in Montpellier, was the first to adopt the revolving box, by means of which the children could be conveyed into the building without any possibility of those

who brought them being seen. At other places foundlings were put into marble shells at church doors.—The great hospital of Santo Spirito in Rome, on the right bank of the Tiber, near St. Peter's, contains a foundling hospital capable of accommodating more than 3,000 children. The number annually received is about 1,150. During the ten years ending in 1865, out of 11,425 received, 9,260 died. Many of the children are sent to the country to be nursed, and among them the mortality is said to be the greatest. There are several other foundling hospitals in Rome; the total number of foundlings is estimated at more than 3,000 annually, the facilities for admission being so great that children are brought from all parts of central and southern Italy. At Naples foundlings are chiefly cared for at the hospital *della Annunziata*. There are in Naples annually about 2,000 foundlings out of a population in 1872 of about 450,000. Naples has the reputation of devoting more care to the education and welfare of foundlings than any other city of Italy. The number of foundlings in Tuscany is about 12,000 out of a population in 1872 of 2,100,000. A considerable number of the foundlings in Italy are supposed to be legitimate children abandoned on account of poverty. About one in 16 of the children is claimed by the parents; the majority are cared for during infancy and childhood, either in the hospitals or among the neighboring peasantry, who supply them with board at a small remuneration. When of sufficient age they are dismissed to support themselves, but in many of the hospitals they have some claim in after life on occasions of distress or sickness. Many children carried to the foundling hospitals are accompanied by tokens. In the hospital *degli innocenti* at Florence a piece of lead imprinted with a number is hung round the neck of each babe, in such a manner that it cannot be easily removed. By these means, and by other tokens, it is easy to obtain information, even at a late period, in regard to each child. Illegitimate children cannot be returned until the expenses are fully refunded.—There are foundling hospitals in Cadiz, Barcelona, and other Spanish cities, and several in Madrid. The girls brought up in the foundling hospital at Barcelona were formerly led in procession when of marriageable age, and any man who took a fancy to one of them might indicate his choice by throwing a handkerchief on his favorite girl, and marry her. The number of foundlings annually received in the principal hospital at Madrid is about 1,200. The hospital is chiefly served by sisters of charity. The infants are intrusted to nurses, and at the age of seven are transferred to the college of the *desamparados* (forsaken), where they receive instruction. Some are sent to an asylum, where they are drafted to learn practical handicrafts, and this asylum is in a great measure self-supporting. In 1794 Charles IV. ordered that children of unknown parents should be considered legitimate and admissible

to public office; that all who called them bastards should be punished; and that foundlings in case of judicial sentence should receive such punishments only as could be imposed upon privileged persons, like the nobility and other high classes. In 1860 there were 149 foundling hospitals in Spain, with 53,464 foundlings; the illegitimate births in 1859 numbered 81,080.—In Portugal, where illegitimate births are much more numerous than in Spain, the number of foundlings is estimated at 77 annually to every 10,000 inhabitants. There are 21 foundling hospitals. The number of foundlings under care in 1860 was 33,500, about 16,000 being received annually, and the mortality was 50 per cent.—Among the first hospitals which educated foundlings in France was the Hôtel Dieu of Lyons (1523). Francis I. founded a kindred institution in 1536. A few years afterward it became customary for sisters of charity to place foundlings at the entrance of the cathedral of Notre Dame of Paris, exclaiming: *Faites bien à ces pauvres enfants trouvés* ("Extend your charity to these poor foundlings"). They were accommodated in an asylum called *la couche* (the bed), at the expense of the dignitaries of the law and of the church. The metropolitan see, the monasteries, and chiefly the hospital of the Holy Ghost, were called upon to contribute toward their support. The dispensation of this charity led to grave abuses. The women hired to take care of the children traded with them. Some were sold to sorcerers, for use in their art; others to beggars, who paraded them in soliciting alms. The asylum was transferred to another place, but the donations were not sufficient to support the institution. The children increased in numbers at a fearful rate. Lots were cast to decide which should have the benefit of education, and those who drew blanks were entirely neglected. Many lost their health or died from the deteriorated milk of sickly nurses. Those admitted into the asylums were almost all illegitimate or of unknown parents. A foundling department was established in 1563 in the hospital of the Holy Ghost, under the direction of the city of Paris, and managed by an association of priests. The children were well educated, many of the boys for the priesthood, and many of the girls were married and provided with dowries. But this hospital (which was suppressed in 1670) refused to receive illegitimate children. St. Vincent de Paul pleaded the cause of the poor children who were excluded, collected funds, and in 1640 established a new institution for foundlings, with the assistance of philanthropic ladies, and with the coöperation of the king and the court. In 1670 it was converted into a public institution by Louis XIV., and was transferred to the rue de Notre Dame. Revenues were assigned to it and taxes raised for its support, and the first president and procurator general of the parliament placed at the head of its administration. The number of

foundlings received at this institution in successive periods of 22 years, from 1640 to 1793, was: 7,668, 14,101, 38,882, 40,437, 64,143, 114,729, 129,143; total, 408,603. More than one third of these children came from the provinces. Serfdom had ceased to exist, and the seigneurs took this means to rid their lands of abandoned children, as they could no longer draw profit from them. In 1779 parliament ordered the nobles to provide for the children found on their lands, and forbade their conveyance into Paris without special permits. After the revolution of 1789 the republic assumed the guardianship of foundlings. The terrorists decreed (July 4, 1793) that they should be called *enfants de la patrie*. In 1798, 11,000,000 francs were assigned toward their support, and it was ordered that two lying-in hospitals should be connected with the foundling house in Paris. But the usefulness of the institution was crippled by a lack of nurses. An imperial decree of Jan. 19, 1811, ordered the establishment of a foundling hospital in each arrondissement of France, to be governed by the following regulations: The children were suckled and weaned in the hospitals, and kept there until the age of six, when they were placed under the charge of peasants and artisans, who received a stipend for their board and training. This stipend was reduced from year to year until the children reached the age of 12, when the able-bodied boys were placed at the disposal of the minister of marine, while for those who were invalids some labor appropriate to their condition was provided in the hospital. They were the property of the state, and those who at the age of 12 had not been taken into the public service were immediately placed under apprenticeship by the administration of the hospital. The expense for nursing and for the outdoor board of the children below the age of 12 was paid by the departments to which they belonged. The expenditure for clothing was paid by the respective hospitals. The number of foundlings annually received in France has varied in recent years from 25,000 to 30,000. The annual number claimed by and restored to their parents is about 3,000, or about 1 in 9. Previous to 1811 the children were deposited in the hands of an officer of the institution; but the decree passed in that year obliged each arrondissement to establish a hospital of deposit, provided with a turning box. In accordance with that decree 256 hospitals were established provided with such boxes, and 17 without them. But many arrondissements removed the boxes and the hospitals of deposit. It was believed that the great increase of foundlings was due to the use of the boxes, hence their suppression. It was discovered that parents put themselves in collusion with those appointed by the hospital to nurse the children or to supply them with board, and it was ascertained that there were mothers who, having discarded their own offspring by secretly depositing them in the turning boxes, managed

to officiate as nurses of the institution. The present annual average of children admitted into the Paris hospital is about 5,000. The percentage of illegitimate children is about 28. Provision is also made for the reception of children whose parents are sick or in prison.—In Belgium 12 cities have foundling hospitals, and elsewhere the children are provided for in the country under the supervision of hospital authorities. The foundling hospitals of Tournay, Namur, Antwerp, Ghent, Mons, and others, have been suspended. The turning boxes were abolished by law in 1834. In the Netherlands the foundling hospitals and the number of foundlings are not given separately in the statistical reports. Germany has numerous institutions for the care and education of deserted children, but no foundling hospitals proper. The latter are considered unfavorable to morality, and the system has been gradually abandoned. The foundlings of Bavaria are placed in the families of farmers, and are under the supervision of the civil magistrate of the district. The Austro-Hungarian empire has 35 foundling hospitals, in which about 120,000 infants are deposited annually, but nearly 90,000 are cared for outside of the institutions. The 35 lying-in hospitals connected with them contain about 1,500 beds, and receive yearly about 20,000 patients. In Vienna illegitimate children are taken care of in the lying-in hospital, which gives a receipt, stating all particulars, for the deposited child; but unless the mother can prove her poverty, or is willing to serve as a nurse for three months, she must pay from 30 to 100 florins for the admission of her child. There are similar institutions at Prague, Brunn, and Gratz.—Toward the end of the 17th century proposals for a foundling hospital were made in London, and one was established in 1739, chiefly through the efforts and at the expense of Capt. Thomas Coram, whose portrait and statue now adorn the chapel of the institution. Handel the composer presented it with an organ and gave several performances for its benefit. The hospital was opened June 2, 1756, and adapted to maintain and educate 500 children. But the great influx of children, the large mortality among them, and the abuses consequent upon the facility of admission, led to a modification of the institution; in 1760 it was changed to a hospital for poor illegitimate children whose mothers had previously borne a good character. In 1870 it maintained 504 children, at an expense of £13,775. In 1704 a foundling hospital was instituted in Dublin. In the 30 years preceding 1825 it received 52,150 infants, of whom 14,618 died infants, 25,829 died in the country, where they had been put out to nurse, 780 died in the infirmary after returning from the country, and 822 died grown children; total number of deaths, 41,524, or at the rate of 4 out of 5. In consequence of this great mortality, the hospital was closed March 31, 1835. The infant orphan asylum at Wanstead, near London, founded by private charity

in 1827, wholly maintains and educates abandoned and orphan children from their earliest infancy to the age of 14 or 15 years. It now has 600 in charge.—In Stockholm, where public prostitution is prohibited, there are 46·01 illegitimate children out of every 100 born, and in the interior of Sweden one out of eight. The Stora Barnhorst hospital of Stockholm, originally established by Gustavus Adolphus for children of military men, is now used as an asylum for infants, who are received without any questions being asked about their parents. Many parents who are fully able to maintain their children send them to it in order to be relieved from the care attending their training and education. There are foundling hospitals in Christiania and other Norwegian cities, and the number of foundlings for the past five years has been more than 9 per cent. of the total number of births.—The foundling hospital of Moscow (*Vospitatelnoi Dom*) was founded by Catharine II. in 1762. It is an immense establishment, which has been enlarged by a member of the Demidoff family, who contributed liberally to its support. A lying-in hospital is connected with the institution. It has secret wards to which more than 2,000 women have recourse annually. The foundling department admits yearly about 12,000 children, who are not left at the door, but taken openly into a room, where the infant is at once received without any other question than "Has the child been baptized?" and if so, "By what name?" The child is then registered, and a number is assigned to it, which it wears around the neck and which is put on its cot, while the bearer obtains a receipt for which he can claim the child up to the age of 10 years. The mother is permitted to nurse the child. The girls are separated from the boys. About 5,000 children are sometimes in the villages in the environs. The inhabitants of a large village near Moscow are entirely devoted to the bringing up of the foundlings. All children are received, whether foundlings or not, on condition that they are given up to the state. About 50 per cent. of them die before the age of one year, and only one quarter of those brought to the institution reach maturity. The government has of late years established many of them as farmers and colonists on the crown lands. Many of the best Russian engineers have been educated in the institution. Those who display great abilities are sent to the university. The majority of the girls are employed in manual labor, the proceeds of which go partly to the treasury of the institution, and are partly saved for them to form their marriage portion; but those of superior ability find opportunities for cultivating it, and may become musicians, actresses, governesses, teachers, &c. All can return to the hospital should they fall into distress in after life. The *Vospitatelnoi Dom* in St. Petersburg was founded by Catharine II. in 1772, as a branch of that of Moscow, but it now eclipses the parent institution. The small

original endowment has been increased by private donations and by large gifts of the successive czars, and the hospital is now one of the wealthiest landed proprietors in Russia. It forms a little district of its own, near the Fontanka canal, in the best part of St. Petersburg, covering 28 acres of ground. In immediate connection with it is a lying-in hospital. The total number of nurses, physicians, cooks, housekeepers, and other employees is about 6,000. The annual receipt of children numbers about 6,000. The mortality is greater than in Moscow, which is accounted for by the inferior vigor of the nurses who come from the vicinity of the capital. A great many children die on the way to St. Petersburg, some being brought 1,000 miles, from Siberia and Bessarabia. One half of Russia sends its surplus of infantine population to this institution, and the other half to that of Moscow. The children are given in care of wet nurses for about six weeks, when they are sent into the country until they are six years old. They are then brought back to the institution and educated. In the lying-in hospital connected with the institution the strictest secrecy is maintained. Stringent laws have been passed since 1837, by which the foundlings become the property of the government, and the hospitals in St. Petersburg and Moscow furnish a constant supply of recruits for the army or navy. These establishments are admirably managed; but those in the interior of Russia are inferior. The property devoted to the support, maintenance, and education of foundlings in Russia is said to amount to \$500,000,000. Infanticide and abortion are exceedingly rare. The proportion of illegitimate births in the whole Russian empire is a little more than 4 per cent.; in cities the average is much larger, and in St. Petersburg and Moscow it is from 20 to 35 per cent.—China has many foundling hospitals, of which those at Shanghai, Ningpo, Canton, and Hangchow are best known. The regulations governing these institutions compare favorably with the best of those in Europe.—One of the most important charitable institutions of the city of Mexico is the *cuna* or foundling hospital. It is supported by private individuals, and the Mexican ladies give it their time and attention. When a child has been about a month in the hospital, it is sent with an Indian nurse to one of the neighboring villages. These nurses are subject to a responsible resident of the village, who guarantees their good conduct. The mothers of the children often officiate as nurses, and are paid for their services. When weaned the child is returned to the hospital, but generally the children are adopted by respectable persons.—In the foundling hospital of Rio de Janeiro, the boys, who are brought up in the neighboring establishment at Botofogo, are apprenticed to trades, and the girls are educated in the city establishment. At each anniversary men in want of wives attend, and any one whose proposals are accepted applies to the managers of

the hospital, who inquire into his character. If it proves satisfactory, the marriage is permitted, and a small dowry is given from the funds of the hospital.—In the United States there are few foundling hospitals except those which have been established and are mainly supported by private charity. Foundlings are sent to the almshouses, whence in many cases they are farmed out, and no systematic records concerning them are kept. Several states have greatly reduced the number of foundlings coming under their direct charge, by increasing the efficiency of private asylums through grants of money and land. The foundling asylum of the sisters of charity in New York city was established in 1869. In 1870 the legislature authorized the city to grant it a site for a building, and appropriated \$100,000 toward its erection, on condition that an equal sum should be raised by voluntary contribution. This amount was obtained, and the building was formally opened in October, 1878. From its commencement in October, 1869, to Oct. 1, 1878, the institution received 5,076 infants, of whom 2,037 have died. A crib was placed in the vestibule every night, and during the first month 29 infants were brought to the house, many of them within three hours of their birth. In every instance except one a slip of paper was left with the child, giving its name and the date of its birth. Want of sufficient funds and room made it necessary to refuse infants more than three weeks old, and still many have to be boarded out in the city and the surrounding country. The number admitted during the year ending Sept. 30, 1878, was 1,124. The expenses of the asylum for this year were \$115,648; of this amount \$80,000 were paid to outside nurses, and about \$7,000 for rent and repairs. Accommodations are furnished for homeless mothers with infants. The infants' hospital in New York, established in 1868, on Randall's island, is under the direction of the department of charities and correction. The number of children in the hospital in 1868, was 1,887, of whom 1,089 died; in 1869, 1,519, of whom 710 died; in 1870, 1,177, of whom 429 died; in 1871, 1,098, of whom 267 died. While in 1869, of the foundlings proper, 70.32 per cent. died, and of mothers' children 20.44 per cent., the deaths among the former amounted in 1871 to only 38 per cent., and among the latter to only about 12 per cent. The decrease is attributed to the renovation of the hospital building. The difference of the mortality between the mothers' children and the foundlings is caused by the continual want of a sufficient number of healthy wet nurses. The present ratio of deaths compares favorably with the usual rate of infant mortality in the city. The nursery and child's hospital in New York was founded in 1854, and has a branch on the north shore of Staten Island. Each has a lying-in department. The number of children received in the entire establishment in 1870 was 447, of whom 128 died; in 1871 the total

number of infants and mothers under its care was 1,046, of whom 938 were children, 174 being born in the institution. The rate of mortality of the infants born alive in the institution was a fraction less than 23 per cent. The New York infant asylum was organized in 1871. Its country home is to be arranged on a cottage system that will admit of proper classification of the nursing mothers and such children as await adoption. The institution receives compensation from the city of New York and the several counties that commit infants to its care. The number received from its opening, Nov. 27, 1871, to the close of the same year, was 23, and no deaths occurred.

FOUNTAIN, a W. county of Indiana, bounded W. by the Wabash river, and drained by Coal and other creeks; area, about 400 sq. m.; pop. in 1870, 16,389. It is intersected by the Indianapolis, Bloomington, and Western, and the Toledo, Wabash, and Western railroads, and by the Wabash and Erie canal. It has a level surface, about a quarter of which is occupied by fine prairie land, while much of the remainder is covered with thick forests. The soil consists chiefly of a rich black loam. Coal and iron are obtained in large quantities. The chief productions in 1870 were 413,786 bushels of wheat, 574,426 of Indian corn, 59,681 of oats, 58,809 of potatoes, 10,679 tons of hay, 257,196 lbs. of butter, and 90,028 of wool. There were 6,578 horses, 3,977 milch cows, 6,972 other cattle, 26,389 sheep, and 28,300 swine; 8 manufacturing of carriages and wagons, 10 of barrels and casks, 2 of furniture, 7 of bricks, 2 of printing, paper, 10 of saddlery and harness, 1 of woollen goods, 7 flour mills, 19 saw mills, 2 distilleries, 5 breweries, 4 tanneries, and 4 currying establishments. Capital, Covington.

FOUQUÉ, Friedrich Heinrich Karl de la Motte, baron, a German novelist and poet, born in the town of Brandenburg, Feb. 12, 1777, died in Berlin, Jan. 23, 1843. The grandson of a distinguished general of Frederick the Great, he served in defence of his country in early youth, and again in 1813 in the war against Napoleon, was wounded at Kulm, and present at Leipsic. Devoting himself henceforward to literature, he became one of the most original and fertile writers of the romantic school. An enthusiastic love for the ideal Christian chivalry of the middle ages, and for the ancient national poetry of Scandinavia and Germany, pervades most of his works, which embrace novels, epics, dramas, &c. He is best known by his *Undine*, which has been translated into nearly every European language. Of this Coleridge said that there was something in it even beyond Scott; for it was one and single in projection, and presented, what Scott had never done, an absolutely new idea. Of his other tales, all of which have been translated into English, "Sintram" and "Thiodolf" are the most remarkable. A corrected edition of his select works was prepared by Fouqué before his death (12 vols., Halle, 1841).

FOUQUET, or *Fouquet*, Nicolas, marquis de Belle-Isle, a French minister of finance, born in Paris in 1615, died March 23, 1680. He entered the public service at an early age, became procurator general of the parliament of Paris in 1650, and was devoted to the interests of Anne of Austria and of Mazarin, by whose influence he was made superintendent of finances. He succeeded for a time in meeting the enormous expenses of the state, already overlaid with debts, but a large deficit in his accounts brought upon him an accusation of peculation. He had in fact amassed an immense fortune, and had spent 18,000,000 francs on one of his châteaux. Louis XIV. had him arrested in 1661 at a fête which Fouquet was giving in his honor; and he was convicted of peculation and treason, Dec. 20, 1664. Colbert, who succeeded him, was the cause of his ruin. Fouquet died at the castle of Pignerol, after 19 years of captivity. Although strictly watched, he contrived to write considerably while in prison, and several works, chiefly on religious subjects, are attributed to him. The documents referring to his trial were published in Holland in 1665-'7 in 15 vols., and a 2d edition in 16 vols., under the title of *Œuvres de M. Fouquet*, appeared in 1696.

FOUQUIER-TINVILLE, Antoine Quentin, a French revolutionist, born in Hérouel, near St. Quentin, in 1747, guillotined in Paris, May 7, 1795. He studied law in Paris, was for a time procurator at the Châtelet, which place he lost by his misconduct, and afterward obtained that of police clerk. Ruined by vices and harassed by debts, he became an agent for the police, and after the establishment of the revolutionary tribunal, March 10, 1793, was advanced to the post of public accuser before it. From that time till July 28, 1794, he was the indefatigable purveyor of the guillotine. Indifferent to friends and enemies, with equal remorselessness he sent to death Bailly and Danton, Vergniaud and Hébert, Marie Antoinette and Robespierre. Soon after the fall of Robespierre the convention brought him to trial, and he was condemned and executed.

FOURCROY, Antoine François, count, a French chemist, born in Paris, Jan. 15, 1755, died there, Dec. 16, 1809. The son of a druggist in reduced circumstances, he tried to gain a living by several callings, but finally, in 1775, became a student of medicine. In 1777 he published a translation of Ramazzini's Latin "Treatise on the Diseases of Mechanics," with notes and additions. In 1780 he delivered a course of popular lectures on chemistry and natural history, which attracted a large auditory, and were published in 1781. In 1784 he was appointed professor of chemistry at the *jardin du roi*, now *jardin des plantes*, for which post he had been designated by Buffon in preference to Berthollet. He had been previously admitted to the scientific meetings held at the house of Lavoisier, took part in the discussions on systematizing chemistry, and was one of the edi-

tors of the *Méthode de nomenclature chimique*, which appeared in 1787, and marked a new era in the progress of that science. He meanwhile published many papers upon chemistry, and enlarged and improved his lectures. In 1792 he was elected assistant deputy to the convention, and for 18 months devoted his whole time and energy to extracting and purifying saltpetre, which was then much needed in France for the manufacture of gunpowder. During the reign of terror, Desault, Chaptal, and Darcet were indebted to him for their safety; but all his exertions were powerless to save Lavoisier. After the 9th Thermidor, being appointed a member of the committee of public safety, he endeavored to improve the system of public education; he organized the polytechnic school, caused the establishment of three schools of medicine, and suggested the idea of the normal school. On the adjournment of the convention he was elected to the council of ancients, resumed his public discourses on science, and remodelled his lectures, which, under the title of *Système des connaissances chimiques, et de leur application aux phénomènes de la nature et de l'art* (6 vols. 4to or 11 vols. 8vo, Paris, 1801), became "the greatest monument erected to chemical science in the 18th century." Bonaparte appointed him director general of public instruction; under his care the public schools flourished, and no fewer than 800 colleges or lyceums were established. The organization of the new university of France was devised by him, and he expected to be appointed grand master; but Napoleon gave the place to Fontanes. This preyed seriously upon his mind, and hastened his death. Besides the works mentioned above, he wrote *La médecine éclairée par les sciences physiques* (4 vols. 8vo, 1791), *La philosophie chimique* (8vo, 1792), *Tableaux synoptiques de chimie* (atlas folio, 1805), and many scientific papers in the *Mémoires de l'académie des sciences* and other learned collections.

FOUR-EYES, a fish. See ANABLEPS.

FOURIER, Pierre, called also **PIERRE DE MATAINCOURT**, a French religious reformer and founder, born at Mirecourt, Lorraine, Nov. 30, 1565, died in Gray, Franche-Comté, Dec. 9, 1640. After having graduated in the university of Pont-à-Mousson, he became a canon regular of the order of Prémontré in the abbey of Chamousey, near Épinal. In 1595, the persecutions of the degenerate monks having forced him to leave the abbey, he was appointed at his own request pastor of the parish of Matincourt, where his zeal for the education of the poor and his exemplary life soon produced wonderful fruits. He opened a school in his residence, established free schools in the most populous localities, and laid the foundations of the congregation of Notre Dame for the education of young girls. This society was confirmed by Paul V. Oct. 6, 1616, and soon spread all over France and into Canada. In 1621 he was associated by Gregory XV. with Jean de Porcelet, bishop of Toul, for the pur-

pose of effecting a reform of the order of Prémontré. Having persuaded the canons of St. Mary in Pont-à-Mousson to enter into the views of the pope, Fourier went with them to the abbey of St. Remi in Lunéville, where after the ordinary novitiate they bound themselves by solemn vows to a new congregation called St. Saviour, one of whose main obligations was to educate Christian youth. In a few years there were nine houses of these reformed canons, and in 1632 Fourier was elected superior general. The king of France having taken possession of Lorraine in 1634, Fourier and his followers were compelled to seek an asylum in Franche-Comté. They settled in Gray, and there Fourier continued to labor with ever-increasing energy and fruit until his death. He was beatified Jan. 29, 1780, and is generally spoken of as Blessed Peter Fourier. The order was suppressed at the revolution. Of late years an effort has been made to restore the canons regular of Prémontré with the rule of Fourier. The sisterhood of Notre Dame (not to be confounded with the sisters of Notre Dame de Namur) in America has its central house in Montreal, and possesses flourishing establishments in New England and Chili.

FOURIER, François Marie Charles, a French writer on social science, born in Besançon, April 7, 1772, died in Paris, Oct. 10, 1837. From his earliest infancy he manifested a singular originality and force of character. At school he was diligent and quick to learn. The prizes for French themes and Latin verse are assigned to him in the records of the town school for the year 1785. But his favorite early studies were geography, botany, and music. His pocket money was spent in buying globes and charts, and much of his leisure time he devoted to the cultivation of flowers. He was sufficiently master of music to be enabled to construct a new musical notation by which all the different voices and instruments may give the same name to the same note, instead of employing seven or eight different keys or particular scales. On leaving school he was sent to Lyons, where he entered as clerk in a commercial house; but having a desire to travel, he engaged soon after with a house whose business connections extended over France, Germany, Switzerland, Holland, and Belgium. This gave him the opportunities for observation which he desired. In 1793, having received about 100,000 francs as his share of his father's property, he began business for himself in Lyons, embarking his whole fortune in colonial produce, which he purchased at Marseilles, and expected to sell at the former city. But just then the troops of the convention occupied Lyons, and pillaged the inhabitants, taking the greater part of Fourier's fortune. The Lyonnese rose against the revolutionists, and Fourier joined them, but the insurrection was promptly suppressed. Fourier was cast into prison for five days, hourly expecting to be led out to the guillotine, and only escaped

by accident. Flying to Besançon, he was again incarcerated as a suspicious person. By joining the revolutionary army, he was enabled to exchange the cell for the saddle, and served nearly two years as a trooper in the army of the Rhine. He obtained his discharge on account of ill health, Jan. 24, 1795. During his connection with the army he made important military suggestions to the government, for which he received its thanks through Carnot. Subsequently also he attracted the attention of Gen. Bonaparte by a political essay put forth in a local journal. On regaining his liberty, he resumed his commercial pursuits. Employed in a wholesale warehouse at Marseilles, he was chosen to superintend a body of men while they secretly cast an immense quantity of rice into the sea. France had been suffering from scarcity during the year, and these monopolizers had allowed their stores to rot rather than sell them at a reasonable profit. Fourier afterward devoted himself to the study of the means of effectually preventing such abuses of monopoly. In 1799 he believed that he had discovered "the universal laws of attraction," and the essential destiny of humanity upon earth. He spent many years in elaborating these discoveries; his first work, called *Théorie des quatre mouvements et des destinées générales*, was not published till 1808, when he issued the first volume, which was merely a prospectus of the work, intended to procure the means of publishing the rest by subscription; but France being then agitated by the projects of Napoleon, no attention was given to it. It did not make a single convert till 1814, when a copy of it fell into the hands of Muiron of Besançon. As it bore the imprint of Leipsic, without the name or address of the author, it was a long time before he was able to find out Fourier, who then resided at Belle. Muiron afterward assisted him in the preparation and publication of his works. In 1822 Fourier removed to Besançon, and published the first two volumes of his work under the title of *Traité de l'association domestique agricole*, which in its latest form appeared under the more imposing title of *Traité de l'unité universelle*, and was the great work of his life. As originally conceived, it was meant to embrace nine volumes, in the following order: 1, the abstract principles of passionnal attraction, and their partial application to industrial associations; 2, familiar synthesis of the principles of attraction, and their equilibrium in practice; 3, the analysis of man's physical, moral, and mental nature, individually and collectively, with regard to individual society and universal unity; 4, methodical synthesis and transcendental theory; 5, commercial duplicity and ruinous competition; 6, the false development of human nature, and a regular analysis and synthesis of a false development of universal nature, as an exception to universal harmony; 7, universal analogy and illustrations to cosmogony; 8, the scientific theory of the immor-

ality of the soul; and 9, dictionary of contents and references to the whole work. Two volumes only were printed at Paris, and these attracted no attention. Five years later Fourier drew up a brief summary of their contents under the title of *Nouveau monde industriel et sociétaire*, in the hope of getting them into notice in that way. In 1831, when the St. Simonians began to make a stir in France, Fourier, who had established himself in Paris, published a pamphlet against them and the followers of Robert Owen, accusing them of utter ignorance of social science, and of gross charlatanry in their pretensions; and from that time his writings began to receive the attention of minds inclined to such studies. Many of the disciples of St. Simon, seeing the more precise and scientific nature of Fourier's socialism, abandoned their old master for this new teacher. On June 1, 1832, a journal of the socialistic doctrines of Fourier was begun under the name of *Le Phalanstère*. A joint-stock company was formed to realize the new theory of association, and one gentleman, M. Baudet Dulary, bought an estate at a cost of 500,000 francs. Operations were commenced, but for the want of paying shareholders the community dispersed. In 1835 Fourier published another work, *La fausse industrie, morcelée, répugnante et mensongère, et l'antidote, l'industrie naturelle, combinée, attrayante, véridique, donnant quadruple produit* (1 vol. 8vo); but it added nothing to his original discoveries. He was about to publish a second part when he died. On his tomb are engraved the three fundamental axioms of his doctrine: *La série distribue les harmonies; Les attractions sont proportionnelles aux destinées; Analogie universelle*. He was buried in the cemetery of Montmartre in Paris. His friends had meanwhile replaced the *Phalanstère*, which was short-lived, by *La Phalange*; and when the subject had created an audience for itself, a daily paper, *La Démocratie Pacifique*, was established, under the editorship of Victor Considérant. This maintained the propagation till it was discontinued during the reactionary movements which followed the revolution of 1848.—Fourier's doctrines obtained some vogue in France, where a school was regularly organized for their diffusion. At the head of it were Considérant, Cantagrel, Victor Hennequin, Laverdaut, Victor Meunier, and other ardent young men. In England Hugh Doherty placed himself at the head of the movement, and established a weekly paper called "The Phalanx," while in the United States Albert Brisbane, by his vehement expositions of the subject, gave to it an immense éclat and temporary success; but of late years it has died out of the public mind. Nevertheless, the scheme of Fourier deserves notice. He was a man of the noblest humane impulses, of rare acuteness and sagacity, and of original imagination. His negative criticisms of the disorders, the falsehoods, and the

miseries of society, are a fearful exposure of the ulcers of our imperfect civilization; and even those who reject his more positive notions will find abundant material for thought in these exposures. The fundamental and leading principles of Fourier are summed up in the following short formulas: "1. The series distributes the harmonies of the world. 2. Attractions are proportional to destinies. 3. Analogy is universal." In other words: 1, all the harmonies of the universe grow out of a regular and uniform order, which Fourier denominated the law of the series; 2, all beings are led to and kept in their true sphere, not by a principle of external force, but of internal attraction; 3, the universe, being everywhere the same, constructed upon the same infinite model, and according to the same eternal laws, must in every sphere repeat itself, or be analogous. These general principles or deductions Fourier carried out into all branches of science, but his chief application of them was to social science. Society being composed of men, he began with an analysis of human nature, of human impulses and attractions. The permanent principles of nature were three: 1, the active principle, or spirit; 2, the passive principle, or matter; 3, the neutral principle, or the mathematical laws of justice and harmony. The nature of man was coördinate with this division, and contained: 1, his physical nature, adapted to the passive principle, or matter; 2, his moral nature, adapted to the active principle, or spirit; 3, his intellectual nature, adapted to the neutral principles of law and justice. The common object of all his physical desires is sensuous enjoyment; the common object of his moral, mutual affection; the common object of his intellectual, order and association; while over all presides a superior tendency to unity or universal harmony. The essential faculties of the soul, then, or impulses to action or life, Fourier analyzed into five sensuous "passions," four moral passions, and three intellectual passions. Thus:

Sensuous faculties, or modes of enjoyment.	1. Sight, or desire for enjoyments of color, &c.
	2. Hearing, or desire for the pleasures of sound.
	3. Taste, or desire for delights of the palate.
	4. Smell, or desire for agreeable odors.
	5. Touch, or desire for external ease, &c.
Moral affections.	6. Friendship, or the affection of equals.
	7. Love, or the affection of the sexes.
	8. Paternity, or the family affection.
	9. Ambition, or the affection of society.
Intellectual impulses.	10. Cabalistic or emulative impulse.
	11. Alternating or varying impulse.
	12. Composite or combining impulse.
	13. Unityism, or harmonizing aspiration.

These simple and essential desires of the soul, according to Fourier, may all be directed into a contrary and subversive development by the unnatural action of circumstances. In the false conditions of society they become so many uncontrollable and warring appetites. What they want for their rectification and true development is a social sphere adapted to

their harmonic action. Society must be constituted according to the same law of groups and series which harmonizes universal nature. The association of the three principal agents of production, that is, of capital, science, and labor, for the mutual advantage of each member of such association, in the several branches of agriculture, manufacture, commerce, domestic industry, art, science, and education, would prepare the way for this true society. The economies effected in expenditure and consumption would be prodigious; the distribution of labor and of its result would become gradually very exact and equitable; the pleasures of combined and varied exertion would take from toil its monotony and its repulsive aspects; while the skill, the wisdom, the grace of every member of the association would be always available to the benefit of every other member. The unity of the association would be expressed in the common domain and combined dwelling house (the "phalanstery"); the variety, in the separate apartments, the different labors, the individual tastes. A township of about 1,800 persons, male and female, Fourier regarded as the germ of larger combinations, which would interweave and unite themselves together, step by step, until a network of connected associations, bound by the same principles, and governed by a syndic or council of representatives, would be spread over a state, a nation, Europe, the globe. But this grand and world-embracing harmony would be the result of no instantaneous or speedy change, but of a regular development of the combined order, according to the law of the series. Society, he said, passed through a process of regular growth, from its most infantile condition to its highest maturity, when it would again begin to decline, and finally fall into decrepitude and decay. In this it resembled the growth of the individual man, who had his ascending vibration, or advance from infancy to youth, from youth to manhood, from manhood to old age, and then by a descending vibration from old age to death. This universal career of humanity Fourier distributed in the following order: two phases of incoherence, containing each seven social periods; two phases of combination, containing each nine social periods; grand total of 32 social periods or societies. The first seven of these periods, embracing the history and progress of the world up to the present time, he named: 1, Edenism; 2, savagery; 3, patriarchalism; 4, barbarism; 5, civilization; 6, guaranteeism; and 7, simple association. Five of them, as the records of all the earth prove, have been periods of constraint, poverty, oppression, fraud, carnage, and false science; the other two are the feeble dawns of a better day, ushered in by associations of joint interest and reciprocal guarantee. But as soon as society shall have reached them, a higher and composite order begins, when seven other periods, distinguished by successive creations of har-

monic beings, will give happiness to all the world. Then comes the plenitude and apogee of harmony, the pivotal or amphiharmonic age of the race, which nature will recognize by the conversion of the aurora borealis into a boreal crown, encircling the earth as the rings of Saturn encircle that planet, the stationary position of the ecliptic, and the disinfection and perfuming of all the waters of the seas, by means of the boreal fluid. This supreme condition of nature and man will continue for about 8,000 years, when the beam of happiness will again descend, and society pass through a series of declines, similar to the series of its advances. The earth itself will be smitten with a palsy of weakness, and after many convulsions sink into death. The human race, however, will not perish, but by a series of bicomposite transmigrations attain to immortality in other spheres. Fourier was rigidly true to his method in all departments of inquiry, and applied it with the most intrepid and unhesitating fidelity, whatever the conclusions to which it might lead. His cosmogonical and ultramundane speculations therefore assumed often the most grotesque forms; and yet his disciples found so much beauty in his social scheme, that they endured his aberrations for the sake of the comprehensive ideas which he suggested.—His collected works (8d ed., 6 vols., Paris, 1841-'5) do not include all his writings. Some transcendental speculations have since been published separately; others still remain in manuscript.

FOURIER, Jean Baptiste Joseph, a French savant, born in Auxerre, March 21, 1768, died in Paris, May 16, 1830. He was professor of mathematics at Auxerre, afterward a teacher in the polytechnic school at Paris, and in 1798 a member of the scientific commission in Egypt. In 1802 he was appointed prefect of the department of Isère, and in 1808 made a baron. By the draining of the marshes of Bourgoin he freed more than 40 communes from the pestilential malaria to which they had always been subject. On the return of Napoleon from Elba, he issued a proclamation in favor of Louis XVIII., and was removed by the emperor, who however appointed him prefect of the department of the Rhône. In 1817 he became a member of the academy of sciences, and soon afterward perpetual secretary jointly with Cuvier, and in 1827 member of the French academy. Upon the death of Laplace in 1827 he became president of the *conseil de perfectionnement* in the polytechnic school. His principal works are *Théorie analytique de la chaleur* (1822), and *Analyse des équations déterminées* (1831), a posthumous publication, but written in his youth.

FOURNEYRON, Benoit, a French inventor, born in St. Etienne, Oct. 31, 1802, died in Paris, July 8, 1867. He was educated at the school of mines in his native city, and upon leaving it in 1819 was employed in the mines of Creuzot, and invented the turbine. His

first turbine was exhibited with complete success at Inval, near Gisors, in 1834, and the prize of 6,000 francs, which had for nine years remained unawarded, was bestowed upon him by the academy of sciences. His proposal to establish several of these machines in the Seine at Paris, for the purpose of supplying every part of the city with water, as well as of filling the ditches which surround the fortifications, was commended by Arago. He published *Mémoires sur les turbines hydrauliques, et leur application en grand dans les usines et manufactures* (Liège, 1841), and a *Table pour faciliter les calculs des formules relatives au mouvement des eaux dans les tuyaux de conduite* (Liège, 1844).

FOURNIER, Edouard, a French author, born in Orleans, June 15, 1819. He early devoted himself to literary labors, and produced many plays alone or in collaboration with others. One of his best efforts is *Corneille à la butte Saint-Roch* (1862); his drama *Gutenberg* was favorably received in 1868 at the Odéon, after having been rejected by the Théâtre Français. His writings relate to a great variety of subjects, and he has edited many voluminous publications and reviews. His best known works are: *L'Esprit des autres* (1855; 4th enlarged ed., 1861); *L'Esprit dans l'histoire* (1857; 2d ed., 1860); and *Le vieux-neuf, histoire ancienne des inventions et découvertes modernes* (2 vols., 1859).

FOWLER, I. Oron Squire, an American phrenologist, born in Cohocton, Steuben co., N. Y., Oct. 11, 1809. He graduated at Amherst college in 1834, and immediately began to lecture on phrenology. In 1835 he and his brother Lorenzo opened an office in New York. In 1836 the two wrote and published "Phrenology Proved, Illustrated, and Applied." "The Self-Instructor in Phrenology and Physiology" (1849) is also their joint production. In October, 1838, he issued in Philadelphia the first number of the "American Phrenological Journal," which was published in that city till 1842, when it was removed to New York, and continued by the firm of O. S. and L. N. Fowler, which became Fowlers and Wells in 1844, and, by the retirement of the Fowlers, S. R. Wells in 1868. Meantime Mr. Fowler has pursued, as editor, lecturer, and author, a career of unusual activity, lecturing in almost every part of the United States and Canada. The entire years 1872 and 1873 were devoted to lecturing in California and on the Pacific coast. In 1863 he removed to Boston, where he now resides (1874). Among the many volumes on phrenology and kindred subjects which he has published, may be mentioned "Memory and Intellectual Improvement applied to Self-Education" (1841); "Physiology, Animal and Mental, applied to Health of Body and Power of Mind" (1842); "Matrimony, or Phrenology applied to the Selection of Companions" (1842); "Self-Culture and Perfection of Character" (1843); "Hereditary

Descent, its Laws and Facts applied to Human Improvement" (1848); "Love and Parentage applied to the Improvement of Offspring" (1844); "A Home for All, or the Gravel Wall and Octagon Mode of Building" (1849); and "Sexual Science" (8vo, Philadelphia, 1870).

II. Lorenzo Niles, brother of the preceding, born in Cohocton, June 28, 1811. His early history is almost identical with that of his brother, whom he accompanied on his lecturing tours. He has also lectured alone in all the considerable towns of the United States and the British American provinces. In 1863 he went to London, where he now resides (1879) and has lectured in all parts of Great Britain. Several of his lectures have been published in London, but not reprinted in the United States. In addition to the works written in connection with his brother, he is the author of the "Synopsis of Phrenology and Physiology" (1844), and "Marriage, its History and Philosophy, with Directions for Happy Marriages" (1846). As a member of the firm of Fowlers and Wells he was engaged in publishing "Life Illustrated," a weekly journal, and the monthly periodicals, the "American Phrenological Journal" and the "Water-cure Journal," which has been superseded by the "Science of Health." **III. Lydia Folger**, wife of the preceding, born in Nantucket, Mass., in 1823, died in London, Jan. 26, 1879. She was a graduate of the Syracuse medical college, and practised medicine. She also lectured frequently on physiology and the diseases of women and children, and was the author of "Familiar Lessons on Phrenology and Physiology" (1847), and "Familiar Lessons on Astronomy" (1848).

FOWLING PIECE, a weapon used by sportsmen for killing small game. It has always been, among dilettanti addicted to hunting as a pastime, the object of much extravagant and capricious fancy. Like bibliomania, the passion for sporting weapons is often concerned with the extrinsic rather than the intrinsic merit of its object; and weapons by particular makers are valued like the handiwork of the Elzevirs and Foulises, and for similar reasons. The barrels are the most important part of this weapon, and in their construction the maker endeavors to secure the greatest possible lightness consistent with the requisite strength. Before the invention of cast steel, and before the manipulation of that metal was well understood, wrought iron only was used. The iron obtained from the Catalan forges and bloomeries, so generally used a century ago, was, from the nature of the process and materials, of excellent quality. The old habit of saving and reworking scrap iron of all forms tended further to improve it; and it is not surprising to find that, for gun barrels requiring the best iron, small scrap, like old nails, wire, and waste clippings of metal, should have been resorted to. Old horse nails (stubs) were viewed with especial favor, and popular tradition attached some mysterious virtue to the iron which had

performed service in a horse's hoof; they were always saved by farriers with scrupulous care, and sold to the gun makers. The real utility of such material, aside from the quality due to repeated manufacture, lies in the fact that the damask, or shading of barrels, cannot be obtained without using small pieces of iron, which must be welded together, and drawn down into rods under the hammer, and, when twisted and worked into the barrel, must be etched with acids. In welding together these small fragments, a film of cinder forms upon the surface of each; and in the subsequent forging, drawing, or twisting, this film constitutes a vein in the metal, and is made visible by its darker color and the greater facility with which it is dissolved by acids. When the value and properties of cast steel became known, this metal was used in gun barrels, at first in small quantities, but gradually to the extent of three fourths; and finally the highest grade of workmanship involved the use of steel alone. 1. Damask (or "Damascus") barrels are made of metal prepared in the following manner: Alternate strips or layers of soft wrought iron and steel are piled together, and drawn down into rods $\frac{1}{4}$ of an inch square. These rods are then twisted to an extreme degree, until the original angles describe 16 to 20 turns around the axis of the rod in every inch of its length. They are again squared, and three of them are welded together laterally, and drawn into a rod about half an inch wide and a quarter of an inch thick. 2. Wire twist is piled in the same manner and with the same materials as damask; but is drawn into rods three eighths of an inch wide, and of variable thickness. They are not subjected to torsion, like damask, but are hammered at once into the gauge required for coiling, so that the alternating layers of iron and steel may appear like a series of consolidated wires, running around the barrel. 3. The stub twist is forged from a mixture of iron and steel, clipped into shreds, heated, tilted, and rolled into a small rod. This rod is cut into short lengths, which are piled, and drawn into a ribbon of suitable dimensions for coiling. 4. Stub damask is made from the same materials as stub twist, but the rods after the first drawing are subjected to a high degree of torsion, and two or three of them are then welded laterally to form the ribbon. 5. Charcoal iron, or carbonized iron, for barrels, is made from the punchings and clippings of plate and sheet iron, melted and cast into an ingot, which is rolled into rods, the same as stub twist. 6. Three-penny skelp is made by fagoting scrap iron, without steel, heating it in an air furnace, and forging it into small rods, which are cut up, and again tilted into the proper form. 7. Two-penny or Wednesbury skelp is similar to the foregoing, but a lower grade of scrap is used. 8. Sham-damn skelp is common wrought iron, forged at once into the ribbon, and intended only for the commonest article of trade. Of the foregoing varieties

the stub twist is the best, though a good wire twist, if perfectly sound, is fully equal to it; but the latter is more liable to imperfect welding, and the barrels made from it have been known to break transversely; but this is a rare occurrence, and they are not liable to burst. The damask and stub damask are, when skilfully made, very beautiful barrels, of great strength, and slightly inferior to the stub and wire twists. The most curious and elegant damask is made at Liège, and many beautiful specimens are produced at Birmingham in England, at Vienna, Geneva, and Berlin. 9. Of all barrels, those of laminated steel combine in the highest degree lightness and strength, and, though less curious and elaborate in their damaskeening than the true damask, are yet very handsomely shaded. They are made by piling alternate sheets of steel and wrought iron, the former being much the thicker, and hammering the pile down until the laminæ are exceedingly thin. The laminæ are disposed in wavy forms, and their disposition is varied in many ways. Torsion is sometimes given to a moderate extent; but an extreme degree of it is avoided, as it tends to diminish the absolute strength of the ribbon.—The ribbons of various materials are coiled into the form of the barrel, around a mandrel, and the edges of the helix are welded together, about three inches at a heat, by “jumping” the coil on an anvil. The various kinds of barrels made at Birmingham are characterized by the width of the ribbon used for the coil. Thus, the width of the Birmingham damask ribbon is $\frac{1}{4}$ of an inch; of the stub twist, $\frac{1}{8}$; of the stub damask, $\frac{1}{8}$; of the charcoal iron, $\frac{1}{4}$; of the three-penny skelp, $\frac{1}{4}$; of the two-penny skelp, 1 inch; and of the sham-damn, $1\frac{1}{4}$ inch. Most frequently the latter is not twisted at all, but is lap-welded at once into a tube. These dimensions, together with the texture of the etching (when the etching is genuine), are of assistance in identifying the structure. The Liège damask is usually much smaller, both in tracery and in width of helix. Barrels are frequently veneered with damask over a tube of inferior metal, and this deception is difficult to detect in many cases, so artfully is the barrel covered not only in its cylindrical part, but at the ends. But first-class makers never resort to this trick: Veneered barrels are usually thicker and heavier than the varieties they are intended to simulate. It is obvious that a barrel of sufficient strength can be made of the poorest of the foregoing qualities, if the sportsman is willing to tolerate an increased weight; but a sham-damn or two-penny skelp, no thicker than a stub-twist of the best quality, would be nearly as dangerous to the hunter as to his quarry. Excellent barrels are now made of Bessemer and Siemens Martin steel, rivaling all but the laminated steel in absolute strength. They are perfectly plain, without weld or damask, and are made very cheaply, in the same manner as musket barrels (see

MUSKET), by drawing a hollow cylinder of steel to the proper dimensions over a bulbed mandrel. The two barrels of a double-barrelled fowling piece are united by brazing or soldering to an intermediate rib. The taper of the barrels is such that in the setting the two axes converge at a point about 40 yards in front of the muzzle. With this degree of convergence, the cross sections of the rib should be uniform at all points. The best and lightest barrels are usually finished externally in such a manner that a line drawn from breech to muzzle is slightly convex toward the axis of the barrel, and concave outward, and in this case the rib requires very skilful fitting. The lock of the piece is the member most liable to derangement by use. It should be of simple construction, and rather massive. A light, delicate lock should be regarded with suspicion. The points most worthy of attention are: 1. The method of attaching the main spring to the tumbler. The pivots should be large and strong, and fitted with precision. The hammer should be set, with reference to the main spring, in such a manner that the spring may exert its most direct action and greatest force when the hammer is down. 2. The pivot of the sear should be set so that it will be disengaged freely by the trigger, without danger of wearing too much, and at the same time be in no danger of catching at the half-cock notch. 3. The main spring should be attached to the lock plate so that it can be removed readily, and a new one substituted by a good workman. This spring is liable to lose its tension by age, whether in use or not.—Within the past ten years breech-loading fowling pieces have come into general use. That they are more convenient than muzzle-loaders cannot be questioned, and there is no material point in which they are objectionable, excepting the greater cost of weapon and ammunition, which is more than compensated by their great advantages. A serviceable breech-loader involves the use of prepared cartridges, well primed and enclosed in cases of metal or other strong material; copper or brass cases are much the best, since they can be made to enter the chamber loosely, and the elasticity of the metal allows a temporary expansion during the act of discharge, without producing any permanent enlargement, thus permitting the case to be readily extracted afterward. The metal case, moreover, forms a perfect gas check. Papier-maché cases are objectionable, because they are liable to change their dimensions, expanding when long exposed to dampness, and contracting when they dry. Many ready-primed cartridges are liable to failure through a deterioration of the priming. This is a paste containing mercuric fulminate, and the most frequent cause of deterioration is a feeble but continuous voltaic action, which is generated when the fulminate is in contact with two kinds of metal. If a single kind of metal is used (either copper or brass) to form the re-

ceptacle of the fulminate, this will not occur, and the primer will retain its sensitiveness. The variety of breech-loading weapons described in special treatises on this subject is very great.

FOX (*vulpes*, Cuv.) a carnivorous animal belonging to the vulpine division of the family *canidae*. Foxes may be distinguished from the dogs, wolves, and other diurnal *canidae*, by their lower stature, pointed muzzle, shorter neck, slender limbs, and long, bushy, and cylindrical tail; the fur is finer, thicker, and more glossy; they diffuse a strong scent from a gland at the base of the tail, so that hounds can easily track them; they dig burrows, and hunt at night, the pupil of the eye forming a vertical fissure; the dentition is the same as that of the wolf and dog. Foxes are shy, cunning, suspicious, cleanly, unsociable, and incapable of true domesticity; their senses of sight, smell, and hearing are very acute, and their speed is great; their tricks to escape their enemies and to seize their prey are so remarkable, that the epithet foxy is proverbially applied to the cunning, deceitful, and unscrupulous knave. Stealing from his hiding place at night, the fox follows the steps of small animals, and pounces upon the hare in her form, and grouse, partridges, and pheasants on their nests; he is fond of fruit, especially grapes, and will eat squirrels, rats, moles, field mice, cheese, fish, and also small reptiles, insects, and even carrion; in cultivated districts he is fond of visiting the farm yard in search of poultry and eggs. Foxes are so cunning that they are very rarely taken in any kind of trap; the favorite and surest way of destroying them is by meat poisoned by strychnine, which is now familiarly employed for this purpose even by our remote Indian tribes. They bring forth once a year, from four to eight at a birth, the young being born with the eyes closed; the breeding season in the northern states begins toward the end of February, and gestation continues 60 to 65 days. There is considerable variety in the tones of the voice; they lie down in a curved form, sleep profoundly, and, when watching birds, stretch the hind legs behind them, a habit noticed in some dogs; they hunt singly, each one plundering for the satisfaction of his own appetite. Of the 14 or more well ascertained species, six are found in the United States; they are distributed over the surface of both hemispheres, most abundantly in the north, and never, according to Hamilton Smith, south of the equator; the resemblance between the species is greater than in other genera of the family. Prof. Baird restricts the genus *vulpes* to those species having a long muzzle, the tail with soft fur and long hair uniformly mixed, and the temporal crests of the skull coming nearly in contact, the red fox being the type of this section; he proposes the genus *urocyon* for those species which, like the gray fox, have a short muzzle, the tail with a concealed mane of stiff hairs without any inter-

mixture of soft fur, the temporal crests always widely separated, and the under jaw with an angular emargination below.—The common American red fox (*V. fulvus*, Desm.) has long, silky fur, with a full bushy tail tipped with white; the color is reddish yellow, grizzled

American Red Fox (*Vulpes fulvus*).

with gray on the lower back; throat and narrow line on the belly white; back of ears and tips of the hair on the tail (except the terminal brush) black. The cross fox, the variety *decussatus* (Geoff.), has the muzzle, lower parts, and legs black, the tail blacker, and a dark band between the shoulders crossed by another over them; this is found from northern New York to Canada and northern Michigan and Wisconsin, while the red variety occurs from Pennsylvania to Canada, and from the Atlantic to the Missouri. The silver or black fox, variety *argentatus* (Shaw), is black, except on the posterior back, where the hairs are ringed with gray, and the tip of the tail is white; this is found in Washington territory. The European red fox is a different species, the fur being less soft and long, and the tail less bushy and more tapering; the muzzle is longer, the eyes further apart, and the feet more slender; the red color is darker and the tint more uniform, with little of the golden hue of the American species; the space where the whiskers are inserted is white instead of dusky, and there is more white on the throat and belly; this is the *V. vulgaris* (Briss.); it is found from Spain to Norway, and from Great Britain to eastern Russia. These species and varieties vary in length from nose to root of tail from 24 to 30 in., and the tail to end of hair from 16 to 20 in. From the fact that in the bone caves of the United States no skulls of the red fox have been found, while those of the gray fox are common, it is believed by many naturalists that the American red fox is a descendant of the European *V. vulgaris*. The skin of the red fox is worth about \$1 75, that of the cross fox about

two or three times as much, and that of the black fox much more; but prices vary much according to the caprices of fashion. The American red fox, being a northern species, is rarely hunted by horses and hounds, as the nature of the country would generally render this

European Fox (*Vulpes vulgaris*).

sport impossible, and the people will not permit their standing grain to be trodden down by man and beast. In Great Britain and Ireland, on the contrary, the sport of fox hunting is one of the most popular amusements of the higher classes.—The prairie fox (*V. macrourus*, Baird), the largest species known, inhabits the central portions of North America, and is noted for the beauty of its fur; its general color is like that of the red fox, and it seems to run into the variety of a cross fox; the tint is yellower,

Arctic Fox (*Vulpes lagopus*).

and there is more white below; the tail is uncommonly full and hairy; the skull is characterized by a muzzle as much longer than that of the red fox, as is the muzzle of the latter than that of the European species. The kit or swift fox (*V. velox*, Say) is smaller than the

red species; the head is short and broad, the ears small, and the legs short; the tail is very dense and bushy; the general color above, including the ears and tail, is yellowish gray, grizzled on the back, sides pale reddish yellow, below whitish, and tail black-tipped. The arctic fox (*V. lagopus*, Linn.) is chiefly confined to the arctic regions of both hemispheres, and has rarely been seen within the limits of the United States, though it has occasionally been found in Newfoundland; it is smaller than the red fox, with a very full and bushy tail, the soles of the feet thickly furred, and the pelage fine and dense; in the adult the color is white, in the young grayish leaden. We are familiar with the appearance and habits of this species through the narratives of arctic explorers.—The gray fox (*V. Virginianus*, Schreb.; *urocyon*, Baird) has the head and body about 28 in. long, and the tail 14 or 15 in.; the tail has a concealed mane of stiff hairs. The color is gray varied with black; sides of neck and flanks fulvous; band encircling the muzzle black; throat white; tail hoary on the sides, rusty below, black at the tip. The head is shorter and the body stouter than in the preceding section, and the fur is much coarser. It is decidedly a southern species, being rare north of Pennsylvania, and common from that state southward, and from the Atlantic to the Pacific; it is less daring and cunning than the red fox, and rarely visits the farm yard; it invades the nests of the wild turkey, pounces upon coveys of quails, and gives chase to the rabbit like a dog. When pursued by hounds in open woods, where it cannot skulk through thick underbrush, it will very often climb a tree. In general this species does not dig a burrow, preferring a hollow log or a hole in the rocks for its den; it is often caught in steel traps, and as a pet is less playful and less odorous than the red fox. Its windings when chased afford good sport for the hunter, and its chase with horses and hounds in the southern states, where the ground is favorable, is much relished as a healthful exercise and exhilarating pastime. In Carolina this species produces from three to five young at a time in March or April. The short-tailed fox (*V. or U. littoralis*, Baird) is about half the size of the gray fox, with the tail only one third the length of the body; it resembles a miniature gray fox, of about the size of a house cat, though of stouter body; it was found on the island of San Miguel, on the coast of California.—Other species of fox exist in Nepal, in the Himalaya mountains, in Syria, and in Egypt, named respectively *V. Hodgsonii* (Hardw.), *V. Himalai-cus* (Ogilby), *V. thaleb* (H. Smith), and *V. Niloticus* (Geoff.).

FOX, Charles James, an English statesman and orator, born in London, Jan. 24, 1749, died at Ohiswick, Sept. 18, 1806. His father, Henry Fox, afterward Lord Holland, had amassed a great fortune as paymaster of the forces; his mother was a daughter of Charles,

the second duke of Richmond, and by her he was descended from Charles II. of England and Henry IV. of France. It is said that his father, when he was about 14, having taken him to Spa, gave him five guineas a night to play with; the source, perhaps, of his invincible attachment to gaming. He studied at Wandsworth and Eton, where he impressed his schoolfellows with a conviction of his superiority. From Eton he went in 1764 to Oxford. Here he gamed, studied, and spent profusely the lavish allowance given him by his father. He read Homer and Longinus, and gained a good knowledge of Greek. In later years he was able to repeat long passages from Homer. Leaving Oxford without graduating, he went to the continent in 1766. During his residence abroad he taught himself Italian, and contracted a partiality for Italian literature which lasted through his life. In August, 1768, he returned to England, where he had been elected to parliament in his absence, while yet under age. He took his seat as a supporter of the duke of Grafton's ministry, following the political faith of his father, and made his first speech in the house April 15, 1769. In February, 1770, he was made a junior lord of the admiralty, but resigned in 1772. In January, 1773, he was made one of the lords of the treasury, but came into collision with the premier, and was dismissed Feb. 28, 1774. After his father's death Fox joined the opposition, and was an eloquent assailant of the leading measures of the ministry. He foretold the defeat of the British arms in America, and stood by Edmund Burke in the struggle against the policy of Lord North. In the beginning of 1780 Burke brought forward his plan of economical reform, which was zealously supported by Fox; this was rejected by the house, but resolutions were passed for an inquiry into the public expenditure. Fox supported Pitt's motion for parliamentary reform in May, 1782, and introduced a measure of concession to Ireland. When the ministry of Lord North fell in this year, Fox was made secretary for foreign affairs, and undertook to secure peace with the hostile powers, and the recognition of the independence of the United States. The negotiations were interrupted by the death of the marquis of Rockingham, the prime minister; and when Lord Shelburne took the head of the ministry, Burke, Fox, and several of their associates resigned. In April, 1783, Fox came again into power as foreign secretary in the coalition which he had made with his former enemy, Lord North, and on account of which much odium was cast upon him. On Nov. 18 he introduced his bill designed to relieve the sufferings of India, which he pressed with his usual warmth, and aided by Burke it passed the commons; but the lords, the crown, and the India company being against him, the coalition fell, and the ministry were dismissed, Dec. 18. On resolutions introduced by Fox, there was

a decided majority against the new ministry, and parliament was dissolved. Fox stood for Westminster, against the whole influence of the court and ministry, and was declared elected by a large majority; but the unsuccessful candidate demanded a scrutiny of the vote, and the high bailiff took upon himself to make no return of representatives for the city. The returns being delayed for about a year, Fox entered parliament for a Scotch borough. The high bailiff was afterward fined £2,000. Fox finally triumphed, and the nation was now divided into two parties, that of Fox and that of the king. On April 22, 1788, Fox opened the Benares charge against Warren Hastings, in whose impeachment he aided Burke and Windham. When in 1788 George III. became insane, Pitt advocated the appointment of a regent by parliament, but Fox maintained the right of the prince of Wales, afterward George IV., as indefeasible. The recovery of the king ended the discussion for the time. Fox moved, March 2, 1790, the repeal of the corporation and test acts. A lack of sympathy on this subject, as well as in regard to the principles of the French revolution, arose between him and Burke, and led to their formal separation, May 6, 1791. Fox was in earnest sympathy with liberal principles, and in 1791 aided Wilberforce in his efforts to abolish the slave trade. He introduced a bill defining the powers of juries in trials for libel, which was passed in April, 1792. In 1798 he supported Grey's motion for parliamentary reform, and soon became a leader of the reform party. This party was in a hopeless minority, and finding his opposition in the house of commons useless, he ceased to attend its sessions in 1797; and in 1798 he was struck from the list of privy councillors for having repeated the duke of Norfolk's toast, "The majesty of the people." From 1797 to 1802 he passed his time chiefly in retirement. He planned an edition of Dryden, a defence of Racine and the French stage, a refutation of the historical theories of Hume, and a history of the revolution of 1688. His researches for this last work took him to Paris in 1802, and while there he was treated by Napoleon with marked distinction. Only a portion of the proposed history of the revolution of 1688 was ever written; it is chiefly notable from the fact that Fox would not use any word which had not been used by Dryden. Returning to parliament, he united with Pitt against the Addington ministry, but upon its fall, when Pitt wished to form a new ministry, Fox was expressly excluded by the king, and Pitt was obliged to make his selections from the subordinates of his predecessor. This ministry was dissolved by Pitt's death, Jan. 23, 1806, and Fox became secretary for foreign affairs in the new ministry formed by Lord Grenville. During his short service of only seven months, Fox procured a vote in the commons for the abolition of the slave trade, and entered into

negotiations for peace with France. Fox was one of the most brilliant and successful of debaters. His personal appearance was fine, and his manner impassioned and convincing. His recklessness dissipated his estate, and during a large part of his life he was continually in debt. Yet such was the sweetness of his temper, the generosity of his disposition, and the magnanimity of all his conduct, that he was loved and honored by the purest men of the time. Burke loved him as his chosen friend; with Wilberforce he labored side by side in the cause of humanity; and even the austere Johnson boasted of his friendship. In his political principles he was firm and unbending; no emotion of ambition took him from the path of honor; no opposition terrified or discouraged him. He gave to the whig party of England its distinguishing principles; he originated those measures of reform in the constitution which have finally been adopted; and probably no other statesman has had so large an influence upon the politics of England. Mackintosh says of him: "He certainly possessed, above all moderns, that union of reason, simplicity, and vehemence which formed the prince of orators. He was the most Demosthenean speaker since Demosthenes."—See "Character of the late Charles James Fox," by Dr. Samuel Parr (2 vols. 8vo, London, 1809); "Speeches in the House of Commons by C. J. Fox," with a biographical and critical introduction by Lord Erskine (6 vols., London, 1815); and "Memorials and Correspondence of Charles James Fox," by Lord John Russell (4 vols., London, 1858-'7). Some interesting particulars of the private life of Fox are given in the posthumous "Recollections of Samuel Rogers" (London, 1859), and in "Holland House," by Princess Marie Liechtenstein (London, 1878).

FOX, George, the founder of the society of Friends, born at Drayton, Leicestershire, England, in July, 1624, died in London, Jan. 13, 1691. His father was a zealous Presbyterian, too poor to give his son any education beyond reading and writing. The boy was grave, and fond of solitude and contemplation. He was apprenticed to a shoemaker; but, keeping aloof from his fellow workmen, he meditated upon the Scriptures, gradually shaping the doctrines which he afterward promulgated. About the age of 19 he abandoned his occupation in order to prepare himself for the mission to which he believed he had been called. For some years he led a wandering life, living in the woods and in solitary places, and practising a rigid self-denial. In 1648 he made his appearance as a preacher at Manchester, where the exposition of his peculiar views caused much excitement, and subjected him to imprisonment as a disturber of the peace. Thenceforth, undeterred by the assaults of the populace or the persecutions of the magistrates, he travelled over England, preaching his doctrines with an earnestness and persua-

siveness which won him many converts. He advocated virtue, charity, the love of God, and a reliance upon the inward motions of the Spirit, by which, as he asserted, and not the Scriptures, "opinions and religions are to be tried." Simplicity, not merely in religious worship, but in all the relations of life, was also urged upon his converts; and to his refusal to recognize the ordinary tokens of outward respect, as well as to take any oath, are to be ascribed most of the persecutions and imprisonments to which he was subjected. The term Quakers is said by some to have been first applied to Fox's followers at Derby, in 1650, in consequence of his telling Justice Bennet, before whom he had been brought, to "quake at the word of the Lord." (See FRIENDS.) In 1655 Fox was carried a prisoner to London, and examined in the presence of Cromwell, who not only released him, declaring that his doctrines and conduct were equally harmless, but on several subsequent occasions protected him from persecution. In 1669 he was married to the widow of a Welsh judge, and two years afterward he visited the North American colonies. A large oak in Flushing, Long Island, under which he preached just two centuries before, and which was esteemed a historical monument, was destroyed by fire in October, 1873. On his return to England, in 1673, he was imprisoned for refusing to take the oath of supremacy, and for exciting disturbances among the king's subjects. But he was released within a year, and went in 1677 to Holland, where his preaching was attended with considerable success. He returned to England, was again imprisoned for refusing to pay tithes, revisited Holland in 1684, extending his travels to Hamburg, Holstein, and Dantzic, and a few years before his death established himself in London, where he rested from his labors, although he continued to preach occasionally. Fox was a man of genuine piety, and his meekness, humility, and excellence in the explanation of Scripture and in prayer are mentioned in terms of high praise by his disciple, William Penn. His published works, containing his journal, correspondence, and all his writings upon his doctrine, are numerous and curious. They were partially collected in 3 vols. fol., 1694-1706. An edition in 8 vols. 8vo has been published in Philadelphia.—See "Life of George Fox, with Dissertations on his Views," &c., by S. Janney (Philadelphia, 1852).

FOX, John, an English author, born in Boston, Lincolnshire, in 1517, died in London in 1587. He was educated at Oxford, and elected a fellow of Magdalen college in 1543, but becoming a convert to Protestantism was deprived of his fellowship in 1545, and reduced to great distress by the withholding of his patrimony for the same reason. After some time he obtained a situation as tutor in the family of Sir Thomas Lucy, immortalized by the story of Shakespeare's robbing his deer park. He was next employed by the duchess of Rich-

mond as tutor to the children of her brother, the earl of Surrey, who was then imprisoned in the tower, and afterward executed. After the accession of Edward VI. he was restored to his fellowship. In the reign of Mary he fled to the continent, and was employed at Basel as a corrector of the press. On the death of the queen he returned to England. The duke of Norfolk, one of his former pupils, gave him a pension, and he was appointed to a prebend in the cathedral of Salisbury. This office he retained while he lived, his refusal to subscribe to the new articles of religion preventing any further preferment. He was the author of numerous works, all of which are now nearly forgotten save his *Acta et Monumenta Ecclesiarum*, better known under its English name, "Fox's Book of Martyrs," which first appeared in London in 1563. It details the sufferings of the early Protestant reformers from "the great persecutions, and horrible troubles, that have been wrought and practised by the Romishe prelates, especiallye in this realme of England and Scotlande, from the yeare of our Lorde a thousande, vnto the tyme now present," and met with great success, though its trustworthiness has always been disputed by Catholics.

FOX, William Johnson, an English clergyman and politician, born in Wrentham, Suffolk, in 1786, died June 8, 1864. He was educated at Homerton Independent college, embraced Unitarian doctrines, and became a preacher, in which capacity he officiated many years at the chapel in Finsbury square, London. He took an active part in politics, on the extreme liberal side, and was a popular speaker for the anti-corn-law league. In 1847 he was elected to represent the borough of Oldham in parliament, as successor to William Cobbett, was returned again for the same borough in 1852 and 1857, and held his seat until he resigned in 1862. He contributed largely to the "Westminster Review" and to other periodicals, and published several works, among which are "Lectures on Religious Ideas" and "Lectures to the Working Classes" (4 vols. 12mo).

FOXES, a tribe of North American Indians of the Algonquin family, noted in history as turbulent, daring, and warlike. They were of two stocks, one calling themselves Outagamies or Foxes, whence our English name; the other Musquakink or men of red clay, the name now used by the tribe. They lived in early times with the kindred Sacs east of Detroit, and as some say near the St. Lawrence, so that we may conjecture them to be the Outagwami of the early Jesuit narratives, who resided near Lake St. John. They were driven west, and settled at Saginaw, a name derived from the Sacs. Thence they were driven by the Iroquois to Green bay. About 1658 they were forced from this by the Iroquois and Winnebagoes, and finally took post on Fox river. Here they were visited by the trader Perrot and the missionary Allouez in 1667. They numbered prob-

ably 500 warriors, cultivated Indian corn, and were expert hunters, but had no canoes. Still turbulent, they made war on the Sioux, and held their own against all their enemies, although suffering severe losses. The missionaries failed to make any great impression on them. At the summons of De la Barre in 1684 they sent warriors who joined Durantaye on Lake Erie for the campaign against the Five Nations. They also took part in Denonville's more serious campaign. They soon, however, showed hostility to the French, and opened intercourse with the Five Nations, even proposing to remove to their territory. Won, as French writers charge, by English promises, the Foxes under Pemoussa, with the Maskoutens and Kickapoos, attacked Detroit in 1712. Du Buisson, the French commander, called out the allies of France, and the Foxes were besieged in their fort, where they made a desperate defence; but they finally fled, were pursued, and almost all destroyed at Presque Isle on Lake St. Clair. The rest of the tribe molested every road, and in 1716 Louigny was sent against them. He invested their fort at Butte des Morts on Fox river, and compelled them to sue for peace. They continued hostilities against the French and their allies for years, making the road to Louisiana almost impassable. The French sent another expedition against them under De Ligney in 1728, which ravaged their country, and again in 1734. Finally, in 1746, with the aid of the Menomonees and Chippewas, they drove the Foxes from their river to the Wisconsin. Some Foxes however joined the French in their last struggle for Canada, and served under Montcalm at Fort William Henry. At the close of the war in 1763 they were in a large village of logs and bark on the Wisconsin, with fields of corn and vegetables. Although in 1736 they were reported as reduced to 100 warriors, they are at this time said to have increased to 320. The Foxes took no part in Pontiac's war, but befriended the whites. In 1766 they settled at Prairie du Chien, so named from one of their chiefs, called the Dog. When the American revolution began, they took up arms on the side of the English, and fought under De Langlade. English influence prevailed even after the end of the war. The Foxes did not indeed take part in the Miami war, though some may have been involved with the Sacs who did, five chiefs claiming to act for the Foxes and Sacs. By the treaty of Nov. 3, 1804, for \$2,234 50 and an annuity of \$1,000, the Foxes and Sacs ceded to the United States immense tracts of land on the Missouri, Jeffreon, and Wisconsin rivers, and on the Illinois and its branch the Fox. They were at this time chiefly west of the Mississippi, in a single village, 140 leagues above St. Louis, and numbered 1,200. When the second war with England began, 800 of the Foxes and their kindred the Sacs went to Malden to join the British forces, and took part in the attack on

Sandusky. Keokuk with the friendly Sacs and Foxes retired to St. Louis. In September, 1815, they made peace, agreed to give up prisoners, &c., but one band of Sacs long continued to be called the British band. In 1822 they were on the Mississippi near Fort Armstrong, in three villages, some having moved to the Iowa and returned. They were expert hunters and canoe-men, and cultivated 800 acres of land, raising corn, beans, pumpkins, and melons; many were employed in the lead mines, digging 400,000 pounds in a season. They, with the Sacs, ceded lands by the treaty of Aug. 4, 1824, and July 15, 1830, but were to some extent involved in the Black Hawk war in 1831, begun by that chief of the British band of Sacs who wished to retain Rock Island in Illinois. At the close of this war the two tribes made a treaty at Fort Armstrong with Gen. Scott and Gov. Reynolds, ceding lands for an annuity of \$20,000 for 20 years. By a subsequent treaty at Rock Island they ceded a part reserved in the last, embracing 256,000 acres, for \$192,000. They then centred on the Des Moines in an irregular square tract about 140 miles each way. The Foxes at this time numbered 2,446, cultivating no more than before, though hunting less. Turbulent as ever, they were constantly at war with neighboring tribes. Government removed them again by the treaty of 1842, and in 1849 they were chiefly on the Osage. Since then, in spite of government efforts to civilize and improve them, they have declined in numbers very rapidly, rejecting with steady pertinacity missionaries and schools. In 1872 the Sacs and Foxes who had ceded their lands in Kansas to the United States in 1859 and 1868 numbered only 463, about one half Foxes. They occupied a reservation of 488,840 acres, between the North fork of the Canadian and the Red fork of the Arkansas. The Sacs and Foxes of the Missouri, the band who remained faithful during the Black Hawk war, are reduced to 88, occupying a reservation of 16,000 acres in S. E. Nebraska and N. E. Kansas. This band has nearly twice as much land under cultivation as the former, though those of the Mississippi have more live stock. The latter have annuities amounting to \$60,000; those of the Missouri to \$10,506. In 1857 a party of 317 Sacs and Foxes, tired of being constantly moved from reservation to reservation, bought lands in Tama, Iowa, unaided by government, for they received no annuities. Here they set to work, and have \$10,440 invested in stock, and have raised \$2,715 worth of produce in a year, while by hiring out as farm laborers they are rapidly becoming industrious and self-sustaining. The farmers, who at first laughed at the idea of employing them, now find them good workers.

FOXGLOVE. See DIGITALIS.

FOX HOUND. See HOUND.

FOX ISLANDS. See ALEUTIAN ISLANDS.

FOX RIVER. I. A river of Wisconsin, called by the Indians Neenah. It rises in the S. cen-

tral portion of the state, and flows first nearly S. W. to within $1\frac{1}{2}$ m. of the Wisconsin, when it turns suddenly N., and after a course of a few miles assumes a N. E. direction, passing through Lake Winnebago, and into the S. end of Green bay. The rapids in its lower course furnish immense water power. The channel has been improved so that steamboats pass from Green bay to Lake Winnebago. The subject of connecting the Fox and Wisconsin rivers by a ship canal, so as to admit vessels from Lake Michigan into the Mississippi river, has been much discussed, and a government survey of the route has been made. The whole length of Fox river is about 200 m. II. Also called the Pishtaka, a river which rises in Waukesha co., Wisconsin, flows nearly due S. until it reaches Oswego, Illinois, when it turns S. W., and falls into the Illinois river at Ottawa, after a course of 200 m. It affords abundant water power.

FOY, Maximilien Sébastien, a French soldier and orator, born at Ham, Feb. 3, 1775, died in Paris, Nov. 28, 1825. He entered the army in 1791 as second lieutenant of artillery, served successively under Dumouriez, Moreau, Masséna, and Bonaparte, and became colonel in 1801. His further advancement was for a time impeded by his freedom of speech and his vote against making Napoleon emperor; but for his distinguished services in the Peninsula he was made brigadier general in 1808, and general of division in 1810. At Salamanca, in 1812, he protected the retreat of the French army, and in the following campaigns gained great applause by his skilful manoeuvres. At the battle of Orthez in 1814 he was seriously wounded. On the first restoration he was appointed inspector general of infantry. During the hundred days he was placed in command of a division, fought at Quatre-Bras, and was wounded at Waterloo. On the second restoration he retired to private life, and devoted himself to a history of the peninsular war. In 1819 he was elected to the chamber of deputies by the department of Aisne. For six years he held his seat in the legislature, where he advocated constitutional liberty with energy and boldness, and was recognized as the national orator. His health, impaired by his former wounds, broke down under his parliamentary labors, and he died of a disease of the heart. It having been reported that the only inheritance left his children was his fame, subscription lists were opened, and within a few days the amount had reached 1,000,000 francs. The speeches of Gen. Foy were collected and published in 2 vols. 8vo (Paris, 1826). His unfinished *Histoire de la guerre de la Péninsule* appeared in 1827, in 4 vols. 8vo.

FRACTION (Lat. *frangere*, to break), in arithmetic and algebra, an expression for an unexecuted division, originally invented to represent a quantity less than a unit. Thus $\frac{3}{4}$ originally signified three quarters of one, and afterward was used for the fourth part of three, these

two quantities being identical. The dividend number is called the numerator, because in arithmetic it numbers how many parts are taken; and the divisor is called the denominator, because it names the parts. These terms are retained in algebra, where it is evident that their literal meaning is inapplicable. Fractions are also used to express the ratio of the numerator to the denominator. Thus the expression $\frac{a+b}{a-b}$ may signify the ratio of the sum of the quantities a and b to their difference, or the quotient arising from the division of that sum by that difference. The propriety of indicating the quotient and the ratio by the same sign is evident from the consideration that the quotient bears the same ratio to unity that the dividend bears to the divisor. A decimal fraction is one whose denominator consists of 1 with zeros annexed, in which case the denominator is not written, but is understood from a point being prefixed, with zeros if necessary; thus, .871 means $\frac{871}{1000}$; .0371, $\frac{371}{10000}$, and so on. A continued fraction is a fraction whose numerator is 1, and whose denominator is a whole number plus a fraction whose numerator is 1 and denominator a whole number plus a fraction, &c.

FRACTURE, in surgery, a disruption or separation between the parts of a bone or cartilage, produced by external violence or the sudden and forcible contraction of muscles. The fracture is said to be simple when there is no external wound; compound when complicated with lesion of the surrounding soft parts; and comminuted when the bone is broken into many fragments. Fractures may occur at any time from the end of intra-uterine life to extreme old age; in youth, fractures are comparatively rare on account of the elasticity of the bones, and in advanced life common from their brittleness. Ruptures of vessels and nerves are the most dangerous complications of fractures of the extremities; gangrene is often the consequence of the former, and paralysis, convulsions, or intense pain and inflammation, of the latter; comminuted fracture is very apt to be followed by tedious suppuration, necrosis, false joint, or much shortened limb; dislocation also is not unfrequently added to fracture. Fractures may be transverse or oblique; the former are most common in children, and are accompanied by little displacement; the latter are the most frequent, and often require all the surgeon's skill and sufferer's patience to effect permanent reduction and prevent deformity of the limb. The causes of displacement in the ends are muscular contractions and the weight of the fractured part; the lower fragment rides over the upper, sometimes to the extent of several inches. The bones most liable to fracture are the superficial ones, like the clavicle, tibia, and skull; or such as, like the radius in the forearm, are likely to receive the weight of the body during a fall; old age, caries, and cancer-

ous, scorbutic, and venereal diseases, predispose to fracture. Violence applied to a part does not always produce a direct fracture; for instance, a fall upon the shoulder may indirectly break the clavicle; the kneecap and the olecranon are the bones most commonly broken by muscular action. The physiological symptoms of fracture are pain and inability to move the limb; the physical characters are unnatural mobility of the parts, change in the length, direction, or form of the limb, and crepitation when the broken fragments are moved upon each other. When there is great swelling, it is often difficult to ascertain the nature or even the existence of a fracture. The course of a simple fracture is a painful and inflamed swelling a few days after the accident, with more or less febrile reaction; these gradually subside, and with proper treatment the bone unites in from one to two months, with or without deformity according to circumstances not always under the control of the surgeon; when the constitution is diseased, or the reparative process injudiciously interfered with, union may not take place and a false joint be formed. Complicated fractures often terminate in the death of portions of bone and of the soft parts, in unhealthy abscesses and tetanus, leading perhaps to fatal consequences unless the limb be removed. The prognosis of fracture of course depends on its situation, extent, complication with wounds, and a variety of circumstances which will occur to every physician. The process of reparation has been described in the article *BONE* (vol. iii., p. 61), and it will only be necessary to say here that lymph is effused between the broken surfaces, which is gradually converted into cartilage, and in a few weeks into a spongy ossific mass called the provisional callus; this holds the ends together for a few months until the permanent callus is deposited between them; the former is gradually absorbed, and the latter has all the characters of true bone. In the interior of the skull, however, and in the cavities of the synovial membranes of the joints, no provisional callus is formed; if the parts be kept in close apposition, bony union will slowly take place; if not, the union will be ligamentary. The indications of treatment are to reduce or set the fragments, and keep them at rest and in close contact, so as to prevent deformity; all disturbing muscles must be relaxed, the ends of the bones extended, and the parts properly supported and kept in place; the limb is bandaged, and some kind of splint or apparatus is applied to keep it immovable and of its natural length. Splints are made of wood, pasteboard, tin, and more recently and best of gutta percha, all properly padded and secured against displacement; the starched bandage, consisting of layers of cloth imbued with starch or dextrine, is light, firm, and capable of very exact application; a plaster of Paris apparatus has been much used in Germany, especially

for intractable persons and on the field of battle. When swelling and inflammation run high, antiphlogistic and refrigerant applications should precede the use of bandages and splints; and the latter when applied should be loosened when swelling comes on, and afterward readjusted so as to keep the parts uniformly in place. The variety of bandages, splints, and apparatus for the different kinds of fractures is very great; and in nothing does American surgery stand more preëminent than in its ingenious and effectual instruments for the treatment of broken bones. The accompanying symptoms of depression, inflammation, delirium, painful twitchings of muscles, and other complications, must be treated on principles familiar to every surgeon. When a false joint is produced, attempts at union are made by exciting inflammation in the separated pieces by rubbing, the seton, sawing off the ends, and other operations now in vogue; care being taken at the same time to strengthen the patient, and to correct any evident constitutional vice. In compound fractures, especially the severe ones from railroad accidents, the question of amputation is frequently a most difficult one to resolve; much depends on the strength, habits, and age of the patient, the degree of laceration, the proximity to joints, and the injury to vessels and nerves; if the operation be decided on, it is generally performed at once, before the accession of inflammatory fever. If it be determined to retain the limb, the bone should be reduced to its natural position, loose pieces removed, and the necessary applications be made to induce the wounds to heal; in proper time bandages and splints should be applied; cooling lotions, opium to quiet pain and restlessness, prevention of lodgment of matter, tonics and stimulants to support the strength under profuse discharges, are the additional general indications of treatment.

FRAMINGHAM, a town of Middlesex co., Massachusetts, on the Boston and Albany railroad, at its junction with a branch to Milford, and at the junction of several divisions of the Boston, Clinton, and Fitchburg line, 20 m. W. by S. of Boston; pop. in 1870, 4,968. It is intersected by Sudbury river, and borders on Ockituate lake. There are manufactories of woollens, cars, and carriages, hats and bonnets, &c., and a national bank. The town is the seat of a state normal school, which in 1872 had 10 instructors, 165 pupils, and a library of 1,200 volumes. There are 20 public schools, including 2 high schools, with an average attendance of about 700 pupils; a public library, with about 5,000 volumes; and 10 churches (2 Baptist, 8 Congregational, 1 Episcopal, 1 Methodist, 2 Roman Catholic, and 1 Universalist).

FRANC, the monetary unit in France, Belgium, and Switzerland. The first coins having this name were struck under John the Good of France in 1360; they bore the impression of the king on horseback, and the device

Francorum rex, and were called *francs à cheval*; they were of fine gold, and were worth 1 pound (*livre*), or 20 sols, and weighed 2½ pennyweights. Under Charles V. the impression was of the king on foot, and they were styled *francs à pied*, but retained the same value. Under Charles VII. their weight was reduced to about two pennyweights. The first silver francs were coined by Henry III. in 1575, and presented on one side the head of the king, and on the other a decorated cross, and weighed .585883 pennyweight, and had a current value of 20 sous. Henry III. also coined half-francs and quarter-francs. In 1602 the value of the franc was increased to 21 sous. Having suffered many alterations, chiefly from clipping, Louis XIII. prohibited its circulation for more than its actual value, and substituted the silver louis of 60, 80, 15, and 5 sous value. The franc then ceased to be real money, remaining a unit of valuation. But on the adoption of the decimal system, in 1795, it was chosen as the monetary unit, being divided into tenths, called *décimes*, and into hundredths, called *centimes*; it had a legal weight of 3.215 pennyweights, $\frac{1}{10}$ fine; coins were also struck of 2 and 5 francs value in silver, and of 20, 50, and 100 francs in gold. In Switzerland the franc was adopted as the unit, along with the whole French monetary system, May 7, 1850. In 1864 the pieces of 50 and 20 centimes value were replaced by pieces of equal nominal but less intrinsic worth. After the monetary convention between France, Belgium, Italy, and Switzerland, in 1866, the standard franc of the law of 1795 ceased to exist except in the five-franc pieces; the pieces of 50 and 20 centimes value being reduced to .835 of pure silver instead of .900, and the law requiring their withdrawal from circulation when they have lost .05 in weight.

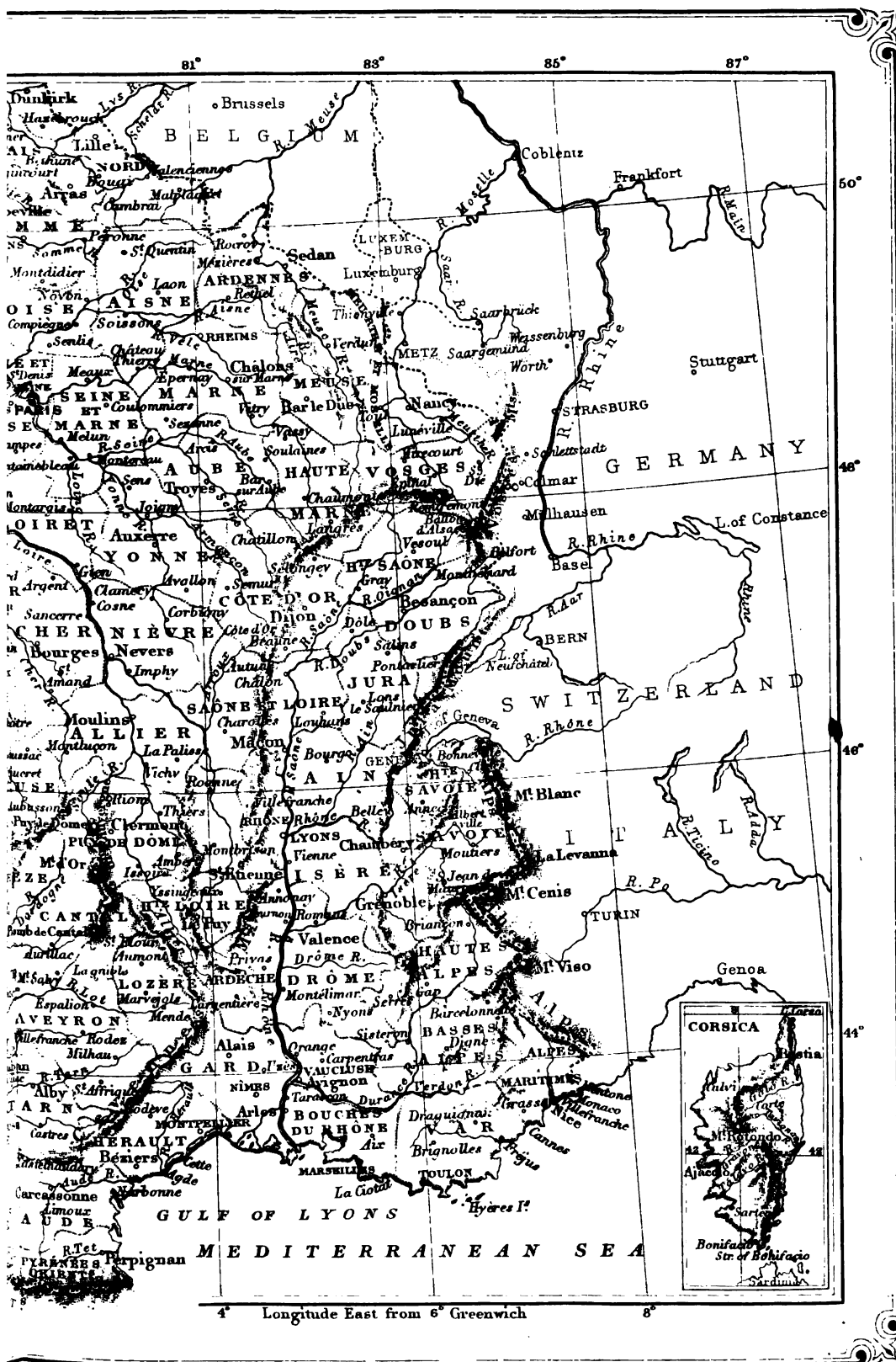
FRANÇAIS, *Antoine*, count, popularly known as **FRANÇAIS DE NANTES**, a French politician and author, born at Beauprépère, Isère, Jan. 17, 1756, died in Paris in 1886. He was the son of a notary, received a superior education, and became in 1789 an advocate and customs director at Nantes and an ardent revolutionist. Subsequently, as a member and for some time president of the legislative assembly, and as a member of the council of five hundred, he acquired great popularity by his denunciations of royalists and priests. He readily accepted office, however, under the consulate, and rose to be director general of the *octroi* department, which gave him opportunities of offering sinecures to poor literary men, who regarded him as a *Mæcenas*. He retained this influential post during the empire, when he was made a count. From 1819 to 1823 he represented the department of Isère in the chamber of deputies. His revolutionary pamphlets met with great success, but his miscellaneous writings brought him little fame. They include *Tableau de la vie rurale, ou l'agriculture enseignée d'une manière dramatique* (3 vols., Paris, 1829).

FRANÇAIS, François Louis, a French painter, born at Plombières, Nov. 17, 1814. He went to Paris in 1829, became a bookseller's clerk, employed his leisure in studying painting, and produced his first landscape in 1841. He has since acquired celebrity in that branch of art, and his masterpiece, "Orpheus," was exhibited in 1868. He has also painted subjects from the environs of Paris and Rome (1866), and Mont Blanc (1869).

FRANCE (Lat. *Gallia* or *Francia*; Ger. *Frankreich*, empire of the Franks), one of the principal countries of Europe, occupying the western end of the central part of that continent, between lat. 42° 20' and 51° 6' N., and lon. 4° 48' W. and 7° 38' E. It is bounded N. by the North sea and the strait of Dover (Pas de Calais), and N. W. by the English channel (La Manche), which separate it from Great Britain; W. by the Atlantic and the bay of Biscay; S. by the Pyrenees, forming its frontier toward Spain, and by the Mediterranean; E. by the Alps, and the Jura and Vosges mountains, which respectively divide it from Italy, Switzerland, and the German empire; N. E., on which side it has no natural boundary, by a conventional line which runs from the Vosges, crossing the Moselle S. W. of Metz, to the shores of the North sea, some 25 m. E. of the strait of Dover, along the frontiers of Germany, the grand duchy of Luxemburg, and Belgium. Under the meridian of Paris, that is, toward its centre, it measures N. to S. about 590 m., and E. to W., between lat. 48° and 49°, about 555 m.; while its greatest length N. W. to S. E., from the extremity of Finistère to Mentone, is about 675 m., and its greatest breadth, N. E. to S. W., from a point E. of Lunéville to the W. extremity of the Pyrenees, a line crossing the former nearly at right angles, is about 550 m. Its total area, the coast islands and Corsica included, is officially computed at 52,857,695 hectares, or 204,091 sq. m. It holds the fourth rank in extent among European countries, being surpassed by Russia, the Austro-Hungarian empire, and Germany.—The shape of France is an irregular hexagon, the sides of which might be drawn respectively along the English channel, the Atlantic, the Pyrenees, the Mediterranean, the Alps, and the Vosges mountains, the last side running from the end of this range to the North sea. The first of these sides, or the N. W. coast, presents from Dunkirk to the mouth of the Somme a succession of sandy downs, from which project Capes Gris Nez and Blanc Nez, opposite Dover. From the mouth of the Somme, sweeping S. W. toward the mouth of the Seine, the coast is characterized chiefly by cliffs of chalk and marl, with here and there harbors, the most important of which is Dieppe. The Seine now widens into a small bay, bearing the name of Seine, Havre, or Calvados, from which the coast line runs almost due W., fringed by a chain of reefs, to the mouth of the Vire, whence it takes a N. direction and forms the square-

shaped peninsula of Cotentin. On the N. face of this peninsula, between Capes Barfleur and La Hague, lies the port of Cherbourg. From Cape La Hague, a low shelving shore, interrupted by granitic cliffs, runs southward to the bay of Cancale, the sandy bottom of which is dry at ebb tide. The coast then resumes its westerly direction to form the triangular peninsula of Brittany, the rocky cliffs of which present a wild and desolate aspect. Its extremity, Cape St. Mathieu or Finistère, runs into the Atlantic, and is the westernmost point of France. The coast is here deeply indented by a large bay, which receives its name from the important military seaport of Brest, and by the less sheltered bay of Douarnenez, which is separated from the former by the peninsula of Crozon. From the point which projects S. of the bay of Douarnenez, the coast, gradually declining and becoming sandy again, recedes E. S. E. toward the mouth of the Loire. From the Loire to the Gironde, the shore, continuing low and sandy, is indented by several bays, generally protected by islands, and presents the two seaports of La Rochelle and Rochefort. From the mouth of the Gironde to the foot of the Pyrenees, the coast is but an unbroken line of sandy downs interspersed with marshes, the only opening to vessels being the basin of Arcachon. Drifting sands have here covered large tracts of good soil, and within the last two centuries a number of scattered cabins, private residences, convents, and even whole villages, have been thus completely buried. Along the Atlantic division, which is about 550 m. in length, there are many islands, including Ushant (Ouessant) on the extreme point of Brittany, Belleisle, nearly opposite the mouth of the Loire, Noirmoutiers, Dien, Ré, and Oléron, between that river and the outlet of the Gironde. At the entrance of the English channel, near the Cotentin peninsula, four islands, Jersey, Guernsey, Alderney (Aurigny), and Sark, although physically belonging to France, are held by Great Britain. The coast of the Mediterranean, about 350 m. long, recedes first toward the northeast, in a semi-circular curve to the mouth of the Rhône, and forms what is improperly called the gulf of Lyons (Fr. *golfe du Lion*); bold and rocky near the Pyrenees, it soon lowers into a sandy beach, intersected by a number of lagoons, such as those of Thau and Valcarès, but without a single good harbor. It is everywhere bordered by shoals, and the accumulation of sand is such as to require constant attention to prevent the filling up of the few indifferent ports which are to be found here. Aigues-Mortes, which was formerly an accessible port, is now some miles from the sea. Agde, notwithstanding works of improvement, affords protection only to a few barks. A more important port is Cette. Beyond the mouth of the Rhône the shore, rising up in bold cliffs, abounds in good ports, the principal of which are Marseilles and Toulon. Between the mouth of the Var and the Italian





boundary line, it is flanked by precipitous Alpine slopes, and gradually assumes the character of the Ligurian Riviera.—Besides the two great mountain chains which form the limits of France toward Spain and Italy, several others of minor importance, belonging to the Alpine and Pyrenean systems, intersect the country. The principal of these chains, which is but a part of the great European watershed, starts from the Pyrenees, taking first a winding course E. N. E. nearly parallel to the Mediterranean shore, then setting northward, under the names of Black mountains, Cévennes, and Côte d'Or; near lat. 48°, where it is called the plateau of Langres and Monts Faucilles, it makes a curve eastward, and then branches, projecting northward the Vosges, and southward various ridges which, through the Jura, connect with the Alps. This chain thus divides France into two very unequal parts, the greater sloping toward the Atlantic and the English channel, the smaller toward the Mediterranean. Four ranges, the general direction of which is N. W., branch off from this watershed and separate the basins of the various rivers flowing into the Atlantic and the English channel: 1, the hills known as the eastern Ardennes; 2, the western Ardennes, connecting with the hills of Picardy and Artois; 3, the branch consisting of the Morvan mountains, the hills of the Orleans forest, those of lower Normandy, and the Monts d'Arrée, extending through the N. part of Brittany; 4, the mountains of Auvergne, which may be more properly called a cluster, of which the mountains of Limousin and hills of Poitou are but the continuation. The Pyrenees also send some secondary ramifications through the southwest. The highest summits of this great chain within the limits of France are from 9,000 to 11,000 ft. above the sea. In the Cévennes ridge, Mt. Mézin is 5,790 ft. high. The Reculet and the Dôle tower over the ranges of the Jura to about 5,500 ft. Among the rounded summits of the Vosges, which are called "balloons," the only one deserving notice is the Ballon d'Alsace, in the southern part of this chain. The group of Auvergne presents the Puy de Dôme, Mt. Dor or Dore, and the Plomb du Cantal, rising to a height of about 6,000 ft. The loftiest summit of the country (excluding Mt. Blanc, which since the annexation of Savoy is exactly on the Italian boundary, but cannot properly be considered as within French territory) is the Pointe des Écrins in the Mont Pelvoux group of the Dauphiny Alps, which is about 13,500 ft. (according to other measurements, Mt. Olan).—The great W. slope of France is divided into three parts, one inclined toward the North sea, another toward the English channel, and the third toward the Atlantic. The first is drained by the Moselle, the Meuse, which flows in a northern direction between the E. and W. Ardennes, and the Scheldt (Escaut); the last two are properly Belgian. The Somme, the Seine, the Orne, the Vire, and the Rance flow into the English channel. The Seine

rises at St. Seine, at the foot of the Côte d'Or, runs in a N. W. direction, receives on its left the Yonne, and on its right the Aube, the Marne, and the Oise, and flows into the sea at Havre. The Atlantic receives the Aulne, the Blavet, the Vilaine, the Loire, the Sèvre-Niortaise, the Charente, the Gironde, and the Adour. The Loire, which is the largest river and waters the most central part of the country, rises in the Cévennes, at Mt. Mézin, runs N. and N. W. to Orleans, and thence S. W. and W. with a somewhat tortuous course to its mouth. It receives on the right the Nièvre, and further down the Mayenne, which, after being joined by the Sarthe, assumes in its lower part the name of Maine; on the left the Allier, the Cher, the Indre, the Vienne swollen by the confluence of the Creuse, and the Sèvre-Nantaise. The Loire and its tributary streams, particularly those from the south, roll down immense quantities of gravel and sand, which, continually shifting, render the navigation difficult and dangerous. A great dike, called the "Levéé of the Loire," the origin of which is lost in antiquity, bounds the course of the river on the right bank from Blois to Angers; this vast work is generally about 25 ft. high and 40 broad. The Garonne, which has its source in the valley of Aran in Catalonia, follows one of the passes of the Pyrenees, flows N. E. until it reaches Toulouse, then turns N. W. and becomes navigable; it receives on the right the Tarn and the Lot, passes Bordeaux, where it is half a mile wide, and meeting the Dordogne about 12 miles below this city, takes the name of Gironde, forms several islands, and broadening into an estuary empties into the sea. The navigation between Bordeaux and the sea is impeded by many shoals; the tide flows up about 80 m., and is sometimes preceded by a huge billow that sweeps destructively along the shore. This phenomenon is called the *mascaret*. The Adour, rising in the Pyrenees, has a semicircular course toward the bay of Biscay, into which it enters after receiving numerous mountain streams. The E. slope, which is inclined toward the Mediterranean, is enclosed between the Jura and the Alps on one side, the Côte d'Or and the Cévennes on the other. It is drained almost entirely by the Rhône and its branches. The Rhône, which, rising in Switzerland, enters France below Geneva, is not very wide, and runs generally with the impetuosity of a torrent. It joins the Saône at Lyons, and flows S. to the Mediterranean, discharging by several branches, forming a delta. It is joined on the left by the Isère, the Drôme, and the rapid Durance, which, like the Isère, rises in the Alps. The few lakes of France scarcely deserve the name; the largest is that of Grand Lieu, near the mouth of the Loire; the most picturesque are those of Gérardmer in the Vosges, and Nantua in the southern part of the Jura.—The geological outline of France is easily marked. A belt of granitic rocks

running through the Vosges, the Alps, the Pyrenees, and the peninsula of Brittany, forms a kind of basin in the centre of which a pile of the same formation rises. This constitutes the Auvergne mountains, which, being mostly composed of granite, gneiss, and micaceous schists, bear abundant traces of recent volcanic activity; extinct craters, lava streams, &c., present an interesting field for the observations of the geologist. The primary rocks at the circumference are of the greatest diversity, the granite however predominating at the extremity of the peninsula of Brittany. The intervals between the external belt and the central nucleus are mostly filled up by secondary formations, interspersed with tertiary deposits. Both are interesting. The former, which are calcareous or marly and generally compact, contain a vast number of shells, madrepores, and other organic remains; stretching in long hill ranges, of little elevation, they run through Lorraine, Burgundy, Franche-Comté, Dauphiny, and Languedoc. Many are steep and bare, or covered only by a thin vegetable soil; but some, the hills of the Côte d'Or especially, are admirably suited for the vine. The most remarkable tract of tertiary formations is known as the "Paris basin;" a larger one covers nearly the whole of the valleys of the Garonne and the Adour, while several others of smaller extent are found in the valleys of the Loire and the Allier. These are mostly calcareous, enclosing great quantities of shells and the remains of fossil mammalia of large size. The district around the mouth of the Rhône is entirely alluvial.—The soil of France, taken as a whole, is of superior quality; and the productive part of it bears a larger proportion to the entire extent of the country than in most other European states. Of the entire soil only 7·5 per cent. is uncultivated or unproductive. Of the productive portion 50 per cent. is arable land and gardens, 4 per cent. vineyards, 28 per cent. meadows and pastures, and 18 per cent. forests.—The climate, being on the whole temperate, is one of the finest in Europe; it is however greatly diversified by the differences of latitude, elevation, soil, exposure, &c. In this respect France has been divided into four regions, each being characterized by a special production: the first, the region of the cereals, extends from the northern frontier to a line drawn from Mézières to Nantes; the second, the region of the vine, is comprised between this line and another passing from a point near Nancy to the mouth of the Charente; the third, through which the cultivation of maize prevails, is bounded S. by a line extending from Grenoble to Perpignan; and the fourth, the region of the olive, includes the southeastern part of the country. The air is generally pure and healthy. The mean annual temperature of different parts of France has been estimated as follows by Humboldt: at Toulon, 62° F.; at Marseilles, 59·5°; at Bordeaux, 56°; at Nantes,

55·2°; at Paris, 51·2°; and at Dunkirk, 50·5°. More rain falls annually in the valley of the Rhône than on the Atlantic slope; the average fall in the former being about 80 inches, while it does not exceed 20 inches in the latter. The centre of the country enjoys a happy medium of temperature and climate; in the south the summers are long, dry, and hot. The mountainous region of Auvergne is visited by long and severe winters. The departments around the gulf of Lyons are subject to disagreeable winds, which sometimes prove injurious to the crops; the most dreaded is the *mistral*.—Of the vegetable products, the most generally cultivated are wheat, rye, maize, buckwheat, oats, barley, potatoes, colewort, black poppy, &c. The chief grain-growing districts are the departments of Eure-et-Loir, Aisne, Le Nord, Meurthe-et-Moselle, Seine-et-Marne, Seine-et-Oise, Seine-Inférieure, Somme, and Pas-de-Calais. Barley, oats, oleaginous seeds, hops, and beet root are mostly cultivated in the department of Le Nord; buckwheat in Brittany. Meadows and pastures are principally found in Normandy. There are vineyards in 76 of the departments. As regards the cultivation of the vine, France occupies the first rank among the states of Europe. Though the amount of wine produced is subject to very considerable variations, it always constitutes one of the most important articles of export. From 1864 to 1869 the produce was as follows (1 hectolitre=26·41 gallons): 1864, 50,658,000 hectolitres; 1865, 68,948,000; 1866, 68,888,000; 1867, 89,128,000; 1868, 52,098,000; 1869, 70,000,000. The production of red is to that of white wine nearly as 8 to 1. The average price of red wine is 14 francs a hectolitre; that of white is 11 francs. Apple trees are abundant in the northwest, and the Normandy cider enjoys a wide reputation in France; hemp and flax are raised in large quantities in the same region; attention is given to the mulberry tree in the south and southeast; madder is successfully cultivated in the southeast on the banks of the Durance; tobacco is raised in the departments of Le Nord, Pas-de-Calais, Gironde, Ille-et-Vilaine, Lot, and Lot-et-Garonne. The principal forest trees are the chestnut on the central mountains, the oak in the Pyrenees, and the fir in Gascony. The most richly wooded districts are the Ardennes table-land, the Vosges, the plateau of Langres, the Côte d'Or, the Cévennes and their ramifications, the Jura, and the Alps. The destruction of wood has been considerable within the last two centuries, and the forests do not cover more than $\frac{1}{10}$ of the whole area of the country. The principal forests still in existence are those of Compiègne, Fontainebleau, L'Esterel, Rambouillet, Villers-Cotterets, and Orleans. The French flora comprises upward of 800 genera and 6,000 species. The numbers of live stock in 1866 were as follows: horned cattle, 12,333,000; sheep, 30,116,000; horses, 3,163,000; mules

and asses, 862,000; swine, 5,650,000; goats, 1,640,000. Within the last 50 years great attention has been given not only to the improvement of native breeds, but to the introduction of foreign ones, which has been generally successful. The best breeds of cattle are those of Auvergne and Gascony; the sheep of Berry are considered the finest; the fattest swine are raised in Lorraine and the Pyrenees; the horses of Limousin, Brittany, Perche, and Normandy are renowned, those of the last two provinces for their strength and size; the mules of Poitou deserve the same praise. Poultry, which is one of the principal articles in the husbandry of France, is raised with peculiar success in Maine, Angoumois, and Burgundy. Eggs are important articles of export, especially to England. Bees are principally raised in the departments bordering on the Mediterranean; the most celebrated honey is that of Narbonne. The wild animals are fast diminishing all over the country; the black bear is confined to the higher ranges of the Alps and the Pyrenees, where the chamois and the wild goat are also found. The lynx appears rarely in these mountains and the Cévennes. Wolves, notwithstanding the active war of extermination carried on against them, are still found in some central departments, especially the mountainous districts. The wild boar, roebuck, and fox are found in all well wooded parts. The red and fallow deer are becoming rare, while hares and rabbits are abundant. Several kinds of squirrels, the polecat, weasel, marten, hedgehog, and other small animals are common. Otters and a few beavers are found in some of the southern streams. Reptiles are few; a venomous kind of viper and a harmless adder are to be found in some regions. Among the birds, which are very numerous, are eagles, vultures, falcons, &c. The rivers and coasts generally abound with fish; fisheries are consequently an important industry and a great source of wealth. Several points on the N. W. and W. coasts furnish excellent oysters. The pilchard fishery, which is conducted mostly on the shores of Brittany, is the most important of all; about 8,000 barrels of salted pilchards are sent into the market annually, and the inhabitants on the coast live in great part on fresh pilchards during the season. The herring fishery, the headquarters of which are at Dieppe, has also some importance, as well as the sole, ray, and mackerel fisheries. The tunny fishery is pursued on the Mediterranean. Dunkirk, Boulogne, St. Valéry-sur-Somme, Dieppe, Fécamp, and St. Malo send yearly a number of ships to the herring, mackerel, cod, and whale fisheries.—The mineral wealth of France is equally large and diversified, although gold and silver are to be found in but very small quantities. The former appears in some small streams flowing from the Pyrenees; a few mines of the latter are wrought, but with little profit, while the precious metal is extracted in larger quan-

tity from lead and copper ores. Large beds of iron ore are found in nearly all parts of France; they are mostly wrought in the departments of Ardennes, Meurthe-et-Moselle, Haute-Marne, Haute-Saône, Isère, Pyrénées-Orientales, Basses-Pyrénées, Ardèche, and Aveyron. They yield annually about 700,000 tons, and give employment to about 15,000 hands. Marble, porphyry, granite, alabaster, and crystals are found in nearly all the mountains; slate in the departments of Ardennes, Maine-et-Loire, and Finistère; building stone of many varieties everywhere. Coal beds of various kinds are also numerous, and within the last 40 years considerable progress has been made in the working of mines. The most productive are to be found in the departments of Le Nord, Loire, Saône-et-Loire, Aveyron, &c., and their annual yield is about 2,000,000 tons. Salt mines are worked in the departments of Meurthe-et-Moselle, Haute-Saône, Doubs, Jura, Ariège, and Basses-Pyrénées, while salt marshes exist along nearly the whole of the seacoast. The produce of both exceeds 1,000,000,000 lbs. annually. Lead is extensively scattered through the mountainous districts, especially in Brittany. Copper is abundant in the Pyrenees, Alps, and Vosges. Together with these metals, zinc, cobalt, and manganese are found. Alum is gathered in Aisne, Oise, and Aveyron. The mineral springs, which are nearly 900 in number, are divided into cold and hot, ferruginous, gaseous, sulphureous, and salt waters; the most renowned are those of Aix, St. Amand, Bagnères-de-Bigorre, Balaruc, Barèges, Bourbon-Lancy, Bourbonne-les-Bains, Canterets, Eaux-Bonnes, Forges, Mont Dor, Plombières, and Vichy.—Previous to the revolution of 1789 France contained 86 provinces, which differed from each other in extent, population, rights, immunities, and administration. By a decree of the national assembly, dated Jan. 15, 1790, the country was divided into departments, which were subdivided into arrondissements, cantons, and communes. According to the official census of 1866, there were 89 departments, 373 arrondissements, 2,941 cantons, and 37,548 communes. In consequence of the loss of territory sustained through the war of 1870-'71, these numbers were reduced in the census of 1872 to 87 departments (including Belfort), 362 arrondissements, 2,865 cantons, and 35,989 communes. The following table shows the departments, the former provinces from which they have been chiefly formed, their population, and their capitals:

PROVINCES.	Departments.	Population in 1872.	Capitals.
N. DIVISION.			
Flanders.....	Le Nord.....	1,447,764	Lille.
Artois.....	Pas-de-Calais.....	761,158	Arras.
Picardy.....	Somme.....	557,015	Amiens.
	Seine-Inférieure.....	790,022	Rouen.
	Eure.....	377,874	Évreux.
Normandy.....	Orne.....	396,250	Alençon.
	Calvados.....	454,012	Caen.
	Manche.....	544,776	St. Ló.

PROVINCES.	Departments.	Population in 1872.	Capitals.
CENTRAL DIVISION. Isle of France	Seine	2,280,060	Paris.
	Seine-et-Oise	580,180	Versailles.
	Oise	390,804	Beauvais.
	Seine-et-Marne	841,490	Melun.
	Aisne	552,489	Laon.
	Ardennes	820,217	Mézières.
Champagne	Marne	886,157	Châlons-sur-Marne.
	Aube	255,687	Troyes.
	Haute-Marne	251,196	Chaumont.
	Meuse	334,735	Bar-le-Duc.
Lorraine	Meurthe-et-Moselle	865,187	Nancy.
	Vosges	892,938	Épinal.
	Loiret	858,021	Orléans.
	Eure-et-Loir	282,622	Chartres.
Touraine	Loir-et-Cher	268,501	Blois.
	Indre-et-Loire	817,027	Tours.
Berry	Indre	277,698	Châteauroux.
	Cher	335,392	Bourges.
Nivernais	Nièvre	339,917	Nevers.
	Allier	390,812	Moulins.
Bourbonnais	Creuse	274,668	Guéret.
	Puy-de-Dôme	566,468	Clermont-Ferrand.
Auvergne	Cantal	281,367	Aurillac.
	Haute-Vienne	822,447	Limoges.
Limousin	Corrèze	802,746	Tulle.
E. DIVISION. Alsace	The territory of Belfort	56,781	Belfort.
	Haute-Saône	308,068	Vesoul.
Franche-Comté	Doubs	291,251	Besançon.
	Jura	267,684	Lons-le-Saulnier.
Burgundy	Yonne	368,608	Auxerre.
	Côte-d'Or	374,510	Dijon.
	Saône-et-Loire	598,844	Mâcon.
	Ain	368,390	Bourg.
Lyonnais	Rhône	670,247	Lyons.
	Loire	550,611	Montbrison.
W. DIVISION. Brittany	Finistère	642,968	Quimper.
	Côte-du-Nord	622,995	St. Brieux.
	Morbihan	490,852	Vannes.
	Ille-et-Vilaine	589,582	Rennes.
Maine	Loire-Inférieure	602,206	Nantes.
	Mayenne	350,687	Laval.
Anjou	Sarthe	446,606	Le Mans.
	Maine-et-Loire	518,471	Angers.
Poitou	Vienne	320,598	Poitiers.
	Deux-Sèvres	381,248	Niort.
Annis and Saintonge. Angoumois	Vendée	401,446	Napoléon-Vendée.
	Charente-Inférieure	465,658	La Rochelle.
Gulenne	Charente	367,520	Angoulême.
	Gironde	705,149	Bordeaux.
	Dordogne	450,141	Périgueux.
	Lot-et-Garonne	819,389	Agen.
S. DIVISION. Gastony	Lot	281,404	Cahors.
	Tarn-et-Garonne	221,610	Montauban.
	Aveyron	402,414	Rodez.
	Landes	300,528	Mont-de-Marsan.
Béarn	Gers	284,717	Auch.
	Hautes-Pyrénées	285,156	Tarbes.
	Basses-Pyrénées	426,700	Pau.
	Ariège	246,298	Foix.
Roussillon	Pyrénées-Orientales	191,856	Perpignan.
	Haute-Garonne	479,862	Toulouse.
	Tarn	352,718	Albi.
	Aude	285,927	Carcassonne.
Languedoc	Hérault	429,878	Montpellier.
	Gard	420,181	Nîmes.
	Lozère	135,190	Mende.
	Haute-Loire	308,732	Le Puy.
Dauphiny	Ardèche	350,277	Privas.
	Isère	575,784	Grenoble.
	Drôme	320,417	Valence.
	Hautes-Alpes	118,898	Gap.
Avignon	Vaucluse	268,451	Avignon.
	Basses-Alpes	139,882	Digne.
	Bouches-du-Rhône	554,911	Marseille.
	Var	298,757	Draguignan.
Provence	Savoie	267,958	Chambéry.
	Haute-Savoie	278,027	Annecy.
	Alpes-Maritimes	199,087	Nice.
	Corse	258,507	Ajaccio.

In population France ranks third among the great European states, being inferior only to Russia and Germany. The gradual increase in population since 1700 is shown in the following table, made up from the official censuses:

Years.	Population.	Years.	Population.
1700	19,669,820	1886	83,540,910
1762	21,769,168	1841	84,580,178
1780	24,800,000	1846	85,401,761
1790	28,500,000	1851	85,751,628
1801	27,849,008	1856	84,089,864
1806	29,107,425	1861	87,472,782
1820	30,431,187	1866	88,067,064
1831	32,550,984	1872	86,102,921

According to this table, within a period of a century and a half the population has not even doubled; but it must be borne in mind that during the middle part of this period the population was heavily taxed by the bloody wars of the empire, by which France lost no fewer than 1,700,000 men on the battle field. A comparison of the movement of population in France with that of the other European countries shows that the average increase in France has been smaller than in any other. The annual average increase from 1821 to 1872 has never been more than 0.69 per cent.; from 1861 to 1866, it was 0.21; from 1856 to 1861, 0.11; from 1861 to 1866, 0.37. Only a few departments which contain the largest cities have doubled their population since 1790; quite as many had in 1872 fewer inhabitants than in 1790. The period from 1866 to 1872 was more unfavorable than any preceding one; for even leaving out of account the territory ceded to Germany, it showed an absolute decrease of population. While the present territory of France in 1866 had 86,469,856 inhabitants, it had in 1872 only 86,102,921; a decrease of 366,935 (0.16 per cent. per annum). In only 14 departments, nearly all containing large cities, had there been an increase. The cities with upward of 80,000 inhabitants showed an aggregate increase of 186,496, though in some there had also been a considerable decrease, as in Brest (18,575), Toulon (7,999), and Toulouse (2,084). The causes of the slowness of increase and of the recent positive decrease in French population are too various to be considered here, and many conflicting opinions have been given concerning them. Legislation which has been indirectly repressive of marriage has undoubtedly had much to do with the matter; and many classes of the people have been led by the laws concerning property to take all possible precautions against the increase of their families. Especially, modern French statesmen agree in confessing that the law of March 7, 1793, which abolishes testamentary freedom, and obliges parents to an equal division of their property among their children, has increased the "sterility of marriages." The average population to the square mile is 177; the density is greater in the north than in the south. Of the male sex there were 17,980,476, of the female 18,122,445; owing to the war, the decrease of the former since 1866 had been almost double that

of the latter (235,830 to 131,105). In respect to occupation the total population of France was, according to the official census of 1866, classified as follows:

OCCUPATIONS.	Total Population.	Percentage.
Agriculture	19,598,115	58
Manufactures	10,950,091	29.64
Commerce	1,517,153	4.11
Occupations connected with the three preceding	1,095,787	2.96
Miscellaneous occupations	193,639	0.54
Liberal professions and rentiers	3,407,295	9.75
Employed by government	564,841	.....
Unknown	526,688	.....
Total	38,067,064	.....

The agricultural population in 1866 was less than in 1851, in which year it amounted to 21,992,874; and in 1872 it showed again a considerable decrease, which, as in many other countries, may be ascribed to the progress of commerce and manufactures, and to the attraction of the cities. The following table shows the number of births and deaths during each of the six years ending with 1870:

YEARS.	Births.	Deaths.	Excess of Births or Deaths.
1855	1,005,758	921,887	83,866 of births.
1856	1,006,256	884,578	121,678 " "
1857	1,007,515	856,687	150,828 " "
1858	984,140	922,038	62,102 " "
1859	948,526	864,530	83,996 " "
1870	943,515	1,046,909	103,394 of deaths.

It will be seen that the excess of births, even before the Franco-German war, had been considerably reduced from its usual ratio; and that in 1870 it gave way to an alarming excess of deaths, which is not fully accounted for by the ravages of the war, but indicates a progressive decrease of fecundity in the population. Twice before there had been an excess of deaths over births, in 1854 of 69,818, and in 1855 of 35,606. The illegitimate children in 1865 constituted 7.65 per cent. of all births; in 1866, 7.62; in 1867, 7.62; in 1868, 7.62; in 1869, 7.48; in 1870, 7.46. The relation of marriages to the entire population was in 1865 as 1 to every 126.8-inhabitants; in 1866, 1 to 122.5; in 1867, 1 to 127; in 1868, 1 to 127.3; in 1869, 1 to 121.4; in 1870, 1 to 165. In no previous year since 1815 had the decrease of marriages been so large as in 1870. The general proportion from 1825 to 1869 had been 1 to from 118 to 128, with the exception of 1847, when it was 1 to 142. The loss of inhabitants by emigration is very small. From 1849 to 1858 the number of emigrants was less than 200,000, while the German emigrants numbered more than 1,200,000, and those from Great Britain 2,750,000. From 1859 to 1868 only 40,000 emigrated, including 10,000 to Algeria. In the following table all the cities of France having more than 70,000 inhabitants are arranged according to population:

CITIES.	Population in 1872.	CITIES.	Population in 1872.
Paris	1,851,792	Nantes	138,517
Lyons	823,417	St. Etienne	110,814
Marseilles	812,864	Rouen	102,470
Bordeaux	194,055	Havre	86,895
Lille	158,117	Roubaix	75,987
Toulouse	124,552	Rheims	71,994

The bulk of the French nation consists of the descendants of Gallo-Romans mixed with German and Scandinavian barbarians (Burgundians, Goths, Franks, and Northmen), who invaded Gaul between the 5th and 10th centuries. But the latter elements are far from being important, and the French may be called a neo-Latin race; their language partakes of the same character, being Latin with a slight admixture of Germanic and Celtic. Although the various races have melted into a single people, some of the original types may be still traced, especially in the remote parts of the country or along the frontiers. The inhabitants of Brittany mostly retain the characteristic features of their ancestors, and the Breton language is still spoken in the western part of that province. The Basques preserve their primitive language. The German element of the population has been reduced to an insignificant number by the cession of Alsace and Lorraine. The Corsicans speak Italian. The inhabitants of other than French descent were in 1872 estimated as follows: Walloons, 1,800,000; Celts, 1,100,000; Italians, 400,000; Basques, 200,000; Spaniards, 100,000; Flemings, 100,000; Jews, 46,000; gypsies, 10,000; Cagots (in the Pyrenees), 5,000.—Although, as has been stated, 53 per cent. of the population of France, and a very much larger proportion of the land, are devoted to agriculture, yet this department of production is far from being in an advanced state of progress, when compared with the agriculture of other nations. By some writers this is attributed to the effect of the law of 1793, which requires the division of estates equally among the children of the testator, and has thus divided France into millions of small farms whose owners have not sufficient capital to cultivate them in the best manner. Comparatively few kinds of labor-saving machinery are in use; the methods of culture are generally primitive and unintelligent on the smaller farms, and the great land owners have only introduced more modern methods within the last 15 or 20 years.—In manufactures, on the other hand, great progress has been made; and as respects the extent and value of her products, France ranks as a manufacturing country next to Great Britain. While she cannot enter into competition with the latter in the manufacture of cotton goods and several other valuable articles, she excels her and other countries in nearly all those requiring particular taste and elegance. Her silk goods hold the most prominent place in this respect. St. Etienne, Lyons, Avignon,

Nîmes, and Tours are the principal seats of this important manufacture, the excellence of which is sufficiently proved by the fact that four fifths of its products are exported. In the manufactures of jewelry and bronze goods France exceeds every other country of the globe; their principal seat is Paris. The capital is also the great centre of the fabrication of surgical and philosophical instruments, books, and what is especially called *l'article-modes*. The publishing business is also carried on with some activity in Lyons, Tours, and several other large cities. Lace, tulle, and embroideries are mostly manufactured in and around Nancy and St. Quentin. Iron works are to be found in various parts of France; the most important are at Creuzot, Nevers, and St. Etienne; the product of pig iron has been on the increase, but is not yet sufficient to supply all the manufactories. The making of cutlery is principally carried on at Paris, Langres, Châtellerault, Moulins, and Thiers; hardware is produced at the same places, as well as St. Etienne, Charleville, &c. There are manufactories of fine porcelain and earthenware at Sévres, Limoges, Nevers, and Monteban; the porcelain of Sévres is much and justly esteemed. Watches are made at Besançon, Montbéliard, Pontarlier, and Versailles. Leather is exported from France in larger quantities than from any other country of Europe; the best manufactures of leather ware are at Paris and Grenoble. The woollen manufacture is of paramount importance; its chief seats are Sedan, Louviers, and Elbeuf, for cloths; Vervins, Rheims, Amiens, Arras, St. Omer, Roubaix, and Tourcoing, for flannels and other coarse stuffs; Paris, Beauvais, and Aubusson, for carpets; the number of spindles employed is about 2,500,000. The cotton manufacture, employing about 4,500,000 spindles (after the cession of Alsace and Lorraine, which had over 2,000,000 spindles), and including all kinds of fabrics, is mostly carried on in the departments of Le Nord, Aisne, Seine-Inférieure, Pas-de-Calais, and Vosges. Linens are manufactured principally in the northern provinces. St. Quentin, Valenciennes, and Cambrai produce the best cambrics; Lyons and Alençon, the best muslins. Mirrors of superior quality are manufactured at St. Gobain, St. Quirin, and Cirey. There were in April, 1873, about 514 houses for the manufacture of beet-root sugar, giving an annual product of 350,000,000 kilogrammes. Ship building is principally carried on at Cherbourg, Brest, Rochefort, Marseilles, Toulon, and Bordeaux. The manufacture of tobacco is carried on in 16 establishments belonging to the state. The total number of steam engines used in France in 1868 was 29,435, of an aggregate of 790,194 horse power; of these 23,450, of 289,676 horse power, were used in 19,887 industrial establishments.—The great articles of export consist of silk, woollen, and other manufactured goods, wines and brandies, joiners' and cabinetmakers' wares, leather, bronze,

steel, and iron wares, paper, refined sugar, china, earthen, and glass wares; while the imports comprise all sorts of colonial produce, cotton, wool, sugar, coffee, spices, dyestuffs, raw silk, woollen, hemp, flax, coal, copper, cattle, hides, &c. These are mostly brought to Marseilles, Havre, Bordeaux, Nantes, Rochelle, Dunkirk, Boulogne, St. Malo, Lorient, Bayonne, Cette, &c., which are also the outlets of exportation. The following tables, compiled from recent official publications, show the so-called "actual" values of the commerce of France, distinguished as "general" and "special;" the former term comprehending all the imports and exports, and the latter only the imports for domestic consumption and the exports of French produce and manufactures. The "official" value, which is that fixed by law in 1826, is somewhat smaller. The sums are given in millions of francs:

YEARS.	GENERAL COMMERCE.		SPECIAL COMMERCE.		PRECIOUS METALS.	
	Imports.	Exports.	Imports.	Exports.	Imports.	Exports.
1866.....	4,258	3,721	3,908.7	2,769.9	657	365
1869.....	4,008.7	3,998.6	3,158.1	3,074.9	647	264
1870.....	3,498	3,456	2,867.4	2,802.1	416	261
1871.....	.....	.....	2,898.2	2,865.6	256	529
1872.....	.....	.....	3,447.5	3,679.0	400	383

The following table exhibits the principal articles of the special commerce in 1872 (values expressed in millions of francs):

ARTICLES.	Imports.	ARTICLES.	Exports.
Silk.....	418.8	Manufa. of silk.....	499.0
Wool.....	311.5	Manufa. of wool.....	290.5
Cotton.....	203.6	Flour and grain.....	264.2
Animals.....	175.9	Wines.....	254.3
Grain.....	167.6	Leather and mfrs. of	235.2
Hides.....	135.0	Small wares.....	146.8
Wood.....	129.8	Silk.....	132.5
Coal.....	128.7	Refined sugar.....	117.9
Sugar.....	117.6	Confectionery.....	107.8
Manufa. of wool.....	100.1	Spirits.....	52.0
Manufa. of cotton.....	84.4	Wool.....	51.0
Flax.....	84.8	Hardware.....	73.6
Tallow.....	74.2	Raw sugar.....	69.4
Oil seed.....	66.6	Manufa. of cotton.....	69.2
Cotton yarn.....	45.0	Cheese and butter.....	56.7
Oils.....	39.1	Cotton.....	49.4

The following table represents the special commerce of France with the countries most largely interested in her trade in 1870, the actual values being given in millions of francs:

EXPORTS.			
COUNTRIES.	Value.	COUNTRIES.	Value.
Great Britain.....	842.8	Russia.....	23.4
Belgium.....	310.8	Hanse Towns.....	22.2
United States.....	266.8	Uruguay.....	22.3
Switzerland.....	262.8	Peru.....	20.1
Italy.....	199.6	United States of Co-	
Algeria.....	109.5	lombia.....	18.2
Spain.....	91.0	Spanish colonies in	
German Zollverein.....	80.6	America.....	16.5
Turkey.....	64.4	Austria.....	13.8
Argentine Republic.....	62.4	Martinique.....	11.6
Brazil.....	54.0	Portugal.....	11.2
Egypt.....	41.2	Greece.....	10.9
Netherlands.....	34.2	Reunion.....	10.2
China.....	33.1	Mexico.....	10.0

IMPORTS.

COUNTRIES.	Value.	COUNTRIES.	Value.
Great Britain.....	529-6	Spanish possessions	
Belgium.....	273-0	In America.....	45-0
Italy.....	232-2	Norway.....	41-8
United States.....	217-6	China.....	41-1
Russia.....	188-4	Egypt.....	38-2
Turkey.....	183-4	Uruguay.....	37-0
British India.....	128-2	Netherlands.....	33-0
Argentine Republic	104-3	Hayti.....	29-7
Switzerland.....	103-4	Austria.....	29-1
Zollverein.....	85-0	Japan.....	27-0
Spain.....	74-0	Réunion.....	25-4
Brazil.....	64-7	Guadeloupe.....	24-9
Peru.....	53-6	Martinique.....	21-7
Algeria.....	47-3	Deep-sea fisheries...	21-6
Sweden.....	45-1	Eng. poss. in Africa	20-5

The total value of imports into France from the United States during the year ending June 30, 1873, was \$34,212,556; and the exports from France to the United States during the same period amounted to \$33,977,524. The ratio of increase of imports and exports since 1855 may be seen from the following figures, representing the average annual general and special commerce, including specie movements, in millions of francs:

YEARS.	GENERAL COM-MERCE.		SPECIAL COM-MERCE.		PRECIOUS METALS.	
	Imports.	Exports.	Imports.	Exports.	Imports.	Exports.
1855-'59.	2,421-6	2,618-8	1,732-1	1,394-1	661	471
1860-'64.	3,057-1	2,861-0	2,298-6	2,409-6	565	529
1865-'69.	3,384-0	4,003-2	2,933-7	2,991-9	781	874

The movement of French shipping during the period from 1867 to 1870 was as follows:

YEARS.	ENTERED AND CLEARED.	
	Vessels.	Tons.
1867.....	54,496	10,492,000
1868.....	54,435	10,654,000
1869.....	53,506	10,954,000
1870.....	52,738	10,424,000

Of the aggregate tonnage about 36 per cent. belonged in 1870 to French vessels, against 38 per cent. in 1869. Foremost among the countries with which France had maritime relations in 1870 were England (3,940,025 tons), Italy (922,718), Algeria (632,602), Russia (526,892), United States (524,538), Turkey (419,866), and Germany (315,364). The strength of the French mercantile navy, exclusive of small fishing vessels, was on Jan. 1, 1870, as follows:

CLASS-B.	Vessels.	Tons.
Sailing vessels.....	15,324	951,714
Steamers.....	454	142,948
Total.....	15,778	1,074,666

In that year 3,681 vessels (including 240 steamers) of 269,283 tons belonged to ports of the Mediterranean, and 12,097 vessels (214 steamers)

of 805,373 tons to ports on the Atlantic. The merchant marine has increased since 1857 by 3,000 vessels, with a gain in capacity of about 180,000 tons. The coast fisheries in 1871 employed 17,998 boats, with 60,635 men. About 30 per cent. of the foreign trade is carried on by land. The coasting trade of France is very large. There are 242 ports, the principal of which, in the order of their importance in this branch of commerce, are Marseilles, Havre, Bordeaux, Rouen, Arles, Honfleur, Rochefort, Dunkirk, Cette, and Libourne.—France has an excellent and extended system of railways. Paris is the central starting point of these roads, which, running in every direction, place the metropolis in direct communication with nearly all parts of the country. They may be divided into the following great lines, each of them sending off numerous branches: 1, the Northern railway, leading to the N. E. frontier, where it connects with the Belgian roads; 2, the Eastern or Strasburg, by Meaux, Châlons-sur-Marne, and Nancy, to the banks of the Rhine; 3, the Southeastern or Mediterranean, passing through Fontainebleau, Dijon, Lyons, and Avignon, to Marseilles; 4, the Orleans, which branches at Orleans into the Central railway, which runs in a S. direction, and the Southwestern or Bordeaux, which first follows the Loire, then runs from Tours to Bordeaux, and terminates at Bayonne, connecting with the Spanish lines; 5, the Western, connecting the metropolis with the seaport of Brest, through Versailles, Le Mans, and Rennes; 6, the Northwestern or Havre, traversing the valley of the Seine. Two other lines of great importance start from Bordeaux: one, the Southern, connects this city with the Mediterranean at Cette; the other gives direct communication between Bordeaux and Lyons, under the name of the Great Central. The aggregate length of railways in operation in September, 1872, was 10,612 m. The aggregate length of telegraph lines at the beginning of 1870 (inclusive of Alsace and Lorraine) was 26,282 m.; of wires, 71,930 m. France is well provided with highways, which are divided into national, military, departmental, communal, and vicinal roads, the cost of each class being respectively defrayed by the government, the departments, or the communes to which they belong. The first class of these thoroughfares, about 200 in number with an aggregate extent of upward of 20,000 m., are wide highways, paved or macadamized, and bordered with fine trees; the departmental roads are tolerably good, but the communal are indifferent, and too often out of repair, as they are not like the others under the charge of civil engineers appointed by the government. The canals, 79 in number, have an aggregate length of about 3,000 m.; among the principal are: the Southern canal (*canal du Midi*), which runs from Cette to Toulouse, where it joins the Garonne, and thus connects the Mediterranean with the Atlantic; the canal of Burgundy, between the Yonne

and the Saône, and the canal of the Rhine and Rhône, connecting these two rivers; the canal of the Centre, between the Loire and the Saône; the Loing, Briare, and Orleans canals, opening a communication between the Seine and the Loire; the St. Quentin canal, which is remarkable for its tunnel, and connects the Oise with the Scheldt; the canal of Brittany, the longest of all, running from Nantes to Brest, 230 m. The railways, highways, and canals are placed under the superintendence of a special department known as the board of engineers of bridges and public ways (*ingénieurs des ponts et chaussées*). Each department has its chief engineer.—The present government of France is a republic, that form having been proclaimed on Sept. 4, 1870, immediately after the downfall of Napoleon III., when a provisional government was instituted. In the hands of a national assembly, at first called only for the purpose of debating on the terms of peace with Germany, the organization of government gradually assumed a more definite form; and although the labors of this assembly have not yet (May, 1874) resulted in a positive and accepted permanent constitution, the present administration of the country pending the completion of this work may be considered fixed as follows. The executive power is exercised by a president, who is responsible to the assembly. The term of office of Marshal MacMahon, who succeeded M. Thiers in this office in May, 1873, has been fixed at seven years by a special decree of that body, passed in November. Under the president, and appointed by him, are the ministers of justice, foreign affairs, the interior, finances, marine and colonies, public instruction, public works, agriculture and commerce, and war, all of whom are also responsible to the assembly. Each department under these has its chief and under secretaries. The national assembly is made up of members elected at different times since its constitution in February, 1871. By a law passed May 24, 1872, a council of state was created, consisting of 28 members elected by the assembly, and 15 appointed by the president. The functions of this body are restricted to the giving of advice on bills presented to the assembly by the government, or on matters submitted to it by the president or ministers. The internal administration of each department is in the hands of a prefect, who is assisted by a council of prefecture, and has under his direction the sub-prefects of the arrondissements; a mayor, aided by a municipal council, is at the head of each commune. The mayors of towns with more than 20,000 inhabitants, and of the capitals of departments and arrondissements, are appointed by the government. In other towns they are elected by the municipal councils. Councils of arrondissement and councils of department hold sessions of a few days twice every year to regulate the assessment of taxes and give expression to the wishes and wants of their respective communities. Such are the

administrative arrangements all over the country, with the exception of the department of the Seine and the city of Lyons, which have an organization of their own.—For the administration of justice France has 27 courts of appeal established in so many of the principal cities, and holding jurisdiction over from one to seven departments. They are composed of a president, several vice presidents, and from 20 to 60 councillors, to whom must be added an attorney general (*procureur général*), assisted by advocates general and substitutes. The principal of these courts is that of Paris. Under them, each arrondissement has its court of original or primary jurisdiction (*tribunal civil ou de première instance*); each canton, its tribunal of justice of peace and its simple police court. At the head of the judiciary establishment stands the court of cassation, which is a supreme court of appeal in both civil and criminal cases. The crime of high treason falls under the jurisdiction of an exceptional high court of justice. The courts of assize (one in each department) are organized juries, but take cognizance of criminal cases only. The court of accounts (*cour des comptes*), although not a regular tribunal, may be also mentioned here; it is established to audit and examine all the accounts connected with the public revenue and expenditure. Besides the regular judiciary courts, tribunals of commerce and councils of *prud'hommes*, chiefly composed of commercial men, have been established in the principal manufacturing and commercial towns, to decide upon cases connected with trade and manufactures. The penitentiary institutions of France, in which great improvements have been made within the last 30 years, are generally well managed and free from abuses. Besides the *bagues* of Brest, Rochefort, and Toulon, most of the inmates of which have been transported to the penal colonies of Guiana, there are 23 central prisons for convicts of various grades, the principal being at Clairvaux, Gaillon, Melun, Poissy, and Clermont-de-l'Oise.—Religious toleration is established by a law which secures equal freedom and protection to every kind of worship; but all forms of religion not expressly recognized by the government are likely to suffer from the regulation which makes meetings of more than 20 persons dependent upon previous authorization by the police. A vast majority of the population belong to the Roman Catholic church. The French government not only supports the pastors of this church, but also those of the Protestant and Jewish communions. France, exclusive of its colonies, is divided into 84 Catholic dioceses, 67 of which are bishoprics and 17 archbishoprics, viz.: Aix, Albi, Auch, Avignon, Besançon, Bordeaux, Bourges, Cambrai, Chambéry, Lyons, Paris, Rennes, Rheims, Rouen, Sens, Toulouse, and Tours. Every bishop and archbishop is assisted by vicars general and a chapter. The dioceses are divided into parishes, which, according to their importance, are intrusted to

priests holding for life, or to ministers removable at will by the bishops. The former are called *curés inamovibles*, the permanency of their office being recognized by the civil authority; the latter *curés amovibles*. The number of priests in 1872 exceeded 40,000; that of convents, 2,600. Each diocese has a *petit séminaire* or college, where the classics, mathematics, natural and mental philosophy are taught; and a *grand séminaire*, or theological seminary. The French Protestants mostly belong to the Lutheran and Reformed or Calvinistic churches, both of which are recognized by the state, which annually appropriates a sum for their support. The Lutherans were greatly diminished in number by the cession of Alsace and Lorraine to Germany; their largest congregations are now found in the departments of Doubs and Seine. In 1872 they had 69 pastors, and about 74,000 church members, with presbyterial councils and 9 consistories, under the superintendence of a director at Paris. The Calvinists, who mostly inhabit the departments of Seine, Gard, Charente-Inférieure, Ardèche, Drôme, Tarn, Tarn-et-Garonne, Lot-et-Garonne, Lozère, and Deux-Sèvres, have 596 church pastors, presbyterial councils, 108 consistories, a central council sitting at Paris, and a theological college at Montauban. The population connected with this church is estimated at 488,000. Of the Protestant churches which receive no government support, the more important are the following: the union of evangelical churches, founded in 1849, with 45 churches and about 8,000 members in 1872; the Methodists, with 24 ministers and 1,916 members; and the Baptists, with 8 congregations and about 800 members. The Jews, numbering about 46,000, who are found principally in the large towns of the east and south, have synagogues at Paris, Nancy, Bordeaux, and Marseilles, with a central council in the capital. The clergy of the Catholic church, which previous to the French revolution was the holder of fully one third of the landed property, and had a yearly income amounting to very near \$40,000,000, now receive a salary, the aggregate amount of which in the budget of 1873 was 51,000,000 fr.—The government has a direct and supreme control over public instruction, through the instrumentality of that powerful institution known as the university of France, and the combined action of its civil officers in the administration thereof. The minister of public instruction, placed at the head of the whole organization, is assisted by an imperial council and a body of 18 inspectors general. The country is divided into 15 districts, each with its academy; the seats of these institutions are at Aix, Besançon, Bordeaux, Caen, Clermont, Dijon, Douai, Grenoble, Lyons, Montpellier, Nancy, Paris, Poitiers, Rennes, and Toulouse. Each academy is governed by a rector, with an academy inspector for every department. The rector is assisted by an academical council, of which he is the presiding officer; the academy inspector, by a

departmental council presided over by the prefect. Three grades of instruction are recognized, superior, secondary, and primary. Superior instruction, embracing the highest branches of human knowledge only, is given by a number of faculties, the professorships of which are intrusted to men of tried capacity and talent. There are 6 faculties of theology (all Catholic), 12 of law, 2 of medicine, 15 of science, and 15 of letters. Secondary instruction is supplied by secondary schools of medicine and pharmacy, national lyceums and communal colleges, under-seminaries, chiefly for theological students, and private institutions and schools. In 1878 there were 78 lyceums, 236 communal colleges, 19 professional schools, and a large number of private institutions. The aggregate number of scholars in the public institutions was about 70,000, the under-seminaries not included. The above two branches of public instruction are under the special control of the rectors and academy inspectors. The third, primary instruction, is especially intrusted to the care of the prefects, aided by special inspectors. For primary instruction there are about 69,000 schools established all over the country. These are supported by the communes; part of their pupils are admitted free of expense; the others pay a trifling annual charge. Asylums for children complete the establishments of primary instruction. Normal schools for the education of primary teachers exist in nearly all the departments, and have worked satisfactorily. The majority of the professors in the national lyceums are educated at the superior normal school in Paris. Candidates for the Catholic priesthood are educated in theological seminaries or *grands séminaires* under the exclusive control of the Catholic bishops; and ministers in the Protestant seminary at Montauban. These schools are of course out of the pale of the university. So are also the polytechnic school, where naval, military, and civil engineers, artillery officers, &c., are educated; the military schools of St. Cyr, La Flèche, and Saumur; the practical schools for artillery and engineering, &c.; all of which are under the supervision of the minister of war. Some other practical schools connected with the navy, civil engineering, the mines, manufactures, forests, &c., are respectively controlled by the ministers to which they more properly belong. The central school of art and manufactures at Paris, a dependency of the ministry of public works, deserves particular notice on account of its general usefulness. Of similar importance are the collège de France, where lectures are delivered on the highest topics of science and literature; the museum of natural history, an admirable collection of animal, vegetable, and mineral wealth, connected with the *jardin des plantes*; and the lectures on oriental languages delivered at the national library. Above all these learned institutions stand the French

academy, the academies of inscription, of science, of the fine arts, and of moral and political sciences, which compose the five classes of the institute of France.—The charitable institutions of France are very numerous. Hospitals and asylums exist in nearly every town of importance. These establishments, some of which hold considerable property, are supported by the state, the department, or the commune. The largest and wealthiest are at Paris, Lyons, Bordeaux, Rouen, Marseilles, Lille, and Nantes. There are military and marine hospitals under the control of the secretaries of war and the navy. The former are established in the principal fortified places, about 40 in number. The four marine hospitals at the great seaports of Cherbourg, Brest, Rochefort, and Toulon can accommodate more than 5,000 patients, and are taken care of by sisters of charity and male overseers. Of several asylums for disabled soldiers and sailors who have served their country for a period of years, the most celebrated is the *hôtel des invalides* at Paris, having a marshal of France for its governor, a large staff of officers, and liberal revenues. It contains nearly 8,000 old soldiers. Among the other institutions are the blind asylum, known as the *hospice des quinquingts*, and the institution for the education of the blind at Paris; the institutions for deaf and dumb there and at Bordeaux; over 40 lunatic asylums, the most important of which is at Charenton, near Paris; foundling hospitals, &c. Poor-relief boards (*bureaux de bienfaisance*) give indoor and outdoor relief to the paupers of the various communes. Various societies for the assistance of prisoners or the sick, and a vast number of philanthropic associations of all kinds, are dispersed throughout the country. There are 46 *monts de piété* (pawnbroking establishments), with a capital of nearly 50,000,000 fr., making yearly loans to the amount of about 60,000,000 fr. Such loans are gratuitous in five of the establishments; interest in the others varies greatly. The first savings bank (*caisses d'épargne*) was established in 1818 at Paris; and on Jan. 1, 1870, there were 525 in all parts of the country. The aggregate number of depositors was 1,968,007; the aggregate amount of deposits about 632,000,000 fr.—A double system of taxation exists in France. The direct taxes are those laid on land (*contribution foncière*), on houses (*contribution des portes et fenêtres*), on persons (*contribution personnelle et mobilière*), and on licenses (*impôt des patentes*). The indirect taxes, besides the import and export duties, comprise excise charges upon wines, brandies, salt, gunpowder, tobacco, postage, public stages and coaches, stamped paper, registry of deeds and sales, &c. This complicated system requires an army of public officers and collectors of every rank, private and general receivers, payers, &c. These are under the control of the minister of finance, who is assisted by numerous finance inspectors and the court of

accounts. Besides the government taxes, there are many local ones, mostly established in the towns of importance to defray local expenditures; they are generally known under the name of *octrois*. The yearly estimate of receipts and expenditures is called the *budget*, which is proposed by the minister of finance and voted upon by the national assembly. The following table presents the expenditures as estimated in the budgets at different periods:

YEARS.	Expenditures, fr.	YEARS.	Expenditures, fr.
1815.....	798,590,859	1857.....	1,698,904,664
1816.....	1,154,649,990	1862.....	1,970,000,000
1860.....	1,095,142,115	1866.....	2,208,808,772
1868.....	1,770,960,740	1870.....	2,324,559,878
1862.....	1,508,898,815		

This list gives the expenditures as estimated in the budgets to be voted on by the legislative bodies; the actual expenditures generally exceeded these estimates by a large amount. This accounts for the increase of the public debt, which has been much larger than the aggregate of differences between receipts and expenditures given in the several budgets. The accounts of actual revenue and expenditure, known as the *comptes définitifs*, have generally not been published before the end of the fifth or sixth year after the vote on the estimates. Thus when the budget of 1872 was voted by the national assembly, the last *compte définitif* made public was that for 1867. As had been usual with financial statements throughout the second empire, this *compte définitif* showed a large deficit actually existing at the end of the fiscal year 1867, although the budget when voted upon had shown a small surplus. The following tables give summaries of the budget for 1872 as voted upon by the assembly, and that of 1873 as projected by the government:

REVENUE.		1873.
1872.		
Ordinary.....	2,344,795,959 fr.	2,406,461,671 fr.
Special.....	820,667,761	868,024,886
Total.....	2,665,893,720	2,739,486,084
EXPENDITURES.		1873.
1872.		
Ordinary.....	2,384,756,306 fr.	2,368,312,948 fr.
Special.....	820,667,761	868,024,886
Total.....	2,655,346,969	2,731,389,306

The following table gives in detail the items of the budget for 1872:

EXPENDITURES.		
(Sums in Francs.)		
1. Public debt and special appropriations.		
Consolidated debt.....	542,197,185	
Funded debt.....	428,055,076	
Floating debt.....	102,486,599	
Expenses of the President's household.....	762,400	
National assembly.....	8,624,000	
Supplementary appropriation for the Legion of Honor.....	14,000,000	
Appropriation for the marine hospitals' fund.....	7,000,000	
Total.....		1,101,005,260

2. Expenses of the various ministries.	
Ministry of finance.....	19,797,700
" " justice.....	88,690,548
" " foreign affairs.....	11,832,500
" " the interior (with Algeria).....	108,930,814
" " war.....	481,000,000
" " marine and colonies.....	144,504,599
" " public instruction.....	94,395,068
" " agriculture and com- merce.....	15,866,800
" " public works.....	127,968,940
	983,783,844
3. Expenses of administration and collection.	
Direct contributions.....	18,350,740
Registration, public domains, and stamps.....	16,824,050
Forests.....	11,587,354
Customs.....	39,344,275
Indirect contributions.....	80,111,670
Tobacco and powder.....	68,089,800
Postal service.....	60,780,015
	328,837,804
4. Rebates and restitutions.....	11,693,800
Grand total of expenditures.....	2,384,759,308
RECEIPTS.	
1. Direct taxes.	
Land tax.....	167,638,000
Personal taxes.....	53,901,530
House tax (<i>contribution des portes et fenêtres</i>).....	87,911,762
Tax on patents.....	66,627,764
<i>Taxe de premier avartisse- ment</i>	554,800
Taxes on mortmain.....	3,300,000
Taxes on mines.....	1,200,000
Apothecaries' and weighers' licenses.....	1,982,600
	829,368,476
2. Indirect taxes and revenues	
Registration and stamps.....	498,674,000
Customs.....	183,893,000
Taxes on salt, sugar, &c.....	898,801,000
Tobacco.....	247,270,000
Powder.....	15,381,000
Postage stamps.....	92,193,000
	1,815,062,000
3. Produce of public domains.....	14,640,000
4. " " forests.....	68,435,500
5. Telegraphs.....	19,920,000
6. State universities.....	4,182,180
7. Receipts from Algeria.....	17,043,554
8. Income devoted to pensions.....	10,887,800
9. Miscellaneous receipts.....	27,392,619
10. Special taxes recently imposed.	
Carriage tax.....	2,112,800
Tax on certain games.....	2,004,000
New stamp taxes.....	118,100,000
Coffee, tea, and cocoa.....	63,898,000
Sugars.....	57,817,000
Liquors.....	88,000,000
Tax on railway tickets.....	80,000,000
Tobacco (special).....	40,000,000
Gunpowder (special).....	8,000,000
Licenses.....	6,800,000
Matches.....	15,000,000
Chicory.....	5,000,000
Paper.....	10,000,000
Mineral oils.....	192,000
Postal taxes (special).....	22,000,000
Taxes on navigation.....	5,000,000
Miscellaneous.....	81,100,000
	457,449,800
11. Miscellaneous sums in hand.....	8,500,000
12. Remaining on hand from the recent loan of two milliards.....	55,000,000
Grand total of receipts.....	2,344,793,959

The continued deficits from 1814 to 1869 were covered by loans inscribed in the *grand liers de la dette publique*, bearing interest, and known as the *rentes* at 3, 4, 4½, and 5 per cent. During the 15 years of the restoration (1815-'30) the national debt was more than trebled; under Louis Philippe (1830-'48) it increased but one

fourth; under Napoleon III. the consolidated debt alone rose from 5,577,000,000 fr. in 1858 (bearing 220,000,000 fr. interest) to 11,710,000,000 fr. in 1870 (bearing 864,000,000 fr. interest). In consequence of the enormous expenses caused by the war against Germany, the interest on the consolidated debt had increased in 1872 to 542,000,000 fr., representing a nominal principal of 15,801,000,000 fr. The other liabilities of the state, including the floating debt (750,000,000 fr.), amounted in the same year to 6,821,500,000 fr., thus swelling the entire public debt of France to 22,622,500,000 fr., bearing an annual interest of more than 1,000,000,000 fr.—The military establishment of France is based on the law of July 27, 1872, which went into operation Jan. 1, 1873. According to this law, every Frenchman must personally render military service, substitution and enlistment for money being forbidden; and every Frenchman not declared unfit for military service may be called upon from the age of 20 to that of 40 years to enter the active army or reserves. He must be enrolled for five years in the active army, four years in the reserve of the active army, five years in the territorial army, and six years in the reserve of the territorial army. Young men who can prove a certain amount of education by passing an examination are permitted to enlist as volunteers for one year only, and to obtain thereby exemption from service in the active army. Soldiers of the active army who can read and write, and have learned their duties, may be furloughed for an indefinite time. The reorganization of the army was not yet completed in 1878. In 1872 the infantry embraced 126 regiments of 4 battalions each, 4 regiments of zouaves, 3 of Turcos, 1 foreign regiment, 80 battalions of chasseurs, and 8 battalions of light African infantry; in all, 184 regiments and 38 battalions, or 569 battalions. The cavalry was composed of 12 regiments of cuirassiers, 20 of dragoons, 14 of chasseurs, 10 of hussars, 4 of chasseurs d'Afrique, and 3 of spahis; in all, 63 regiments. The artillery, according to the budget for 1873, is to be brought to 82 regiments, to which must be added 1 regiment of pontonniers, 10 companies of workmen, 5 companies of gunners, and 2 regiments of train. The engineers embraced thus far 8 regiments of sappers and 1 company of workmen. The government return of 1871 gave the nominal strength of the army on the peace footing as 404,192 men and 86,868 horses; and on the war footing, 757,727 men and 148,288 horses. France is divided into 22 military divisions, governed by generals of division, and the most important by marshals, and into as many subdivisions (under brigadier generals) as there are departments. The headquarters of the divisions are in the following cities: Paris, Rouen, Lille, Châlons-sur-Marne, Besançon, Lyons, Marseilles, Montpellier, Perpignan, Toulouse, Bayonne, Bordeaux, Nantes, Rennes, Bastia, Tours, Bourges, Clermont,

Limoges, and Grenoble (two divisions having no assigned headquarters in 1872). No other country possesses so many fortresses as France. After an imperial decree of June 26, 1867, had stricken 98 fortified places from the list of fortresses, there still remained 119; these are divided into 8 of the first class, 13 of the second, 23 of the third, and 75 of the fourth. The most important are the following: 1, along the N. frontier, Lille, Douai, Condé, Valenciennes, Maubeuge, Givet, Mézières, Sedan, Longwy; 2, along the E. frontier, Belfort, Besançon, Fort de Joux, Lyons, Grenoble, Briançon; 3, along the Mediterranean coast, Antibes, Toulon, Marseilles, Cette, Fort St. Elme, Port Vendres; 4, along the Pyrenees, Bellegarde, Mont Louis, Perpignan, Bayonne; 5, along the W. and N. coasts, the islands of Oléron, Ré, Noirmoutiers, Belle-Isle and Groix, Rochefort, La Rochelle, Lorient, Brest, St. Malo, Mont St. Michel, Cherbourg, Havre, Boulogne, Calais, and Dunkirk. The government has cannon foundries at Douai and Toulouse, and factories of gunpowder, muskets, cannon balls, &c. Its military arsenals and warehouses are very numerous. The French navy at the end of 1871 was composed of 62 iron-clad vessels, 264 screw steamers without armor, 62 paddle-wheel steamers, and 118 sailing vessels; in all, 501 vessels, the steamers with a total of 96,627 horse power, and the whole fleet carrying 8,045 guns. The naval staff consisted of 2 admirals, 18 vice admirals, 32 rear admirals, 182 ship captains, 290 frigate captains, 829 lieutenants, and 610 ensigns. The sailors, afloat and ashore, numbered 89,500. The grand total of men in the service of the fleet, including engineers, dockyard laborers, and others, was 74,000. On a war footing the strength of the navy can be raised to 130,000 men. There are boards of marine engineers, of hydrographical engineers, of inspectors, &c. Naval schools, and several schools of application, for the education and scientific improvement of the officers, and even the seamen, are connected with the navy department. A board of admiralty, another superintending the naval works, and a third attending to the improvement of instruction among the sailors, act as advisers to the minister of marine. The maritime territory of France is divided into five districts or prefectures, subdivided into arrondissements and quarters. The naval prefects reside at Cherbourg, Brest, Lorient, Rochefort, and Toulon, and under them officers, called heads of service, commissaries, and under-commissaries, are placed in the several subdivisions.—France could once boast of the extent of her colonial possessions in America, and also for a while in Asia. She has lost the greater part of them, and possesses now only the following: 1, in Africa, Algeria on the N. coast, several islands, seaports, and military posts on the banks of the river Senegal, the island of Goree on the coast of Senegambia, S. of Cape Verd, Réunion

(formerly Bourbon island), S. E. of that continent, in the Indian ocean, and the islands of Mayotte, Nossi-Bé, and Ste. Marie, near Madagascar; 2, in Asia, the districts of Pondicherry, Karikal, Chandernagore, Yanaon, and Mahé in Hindostan, and six provinces of Cochin China; 3, near the coast of North America, the islands of St. Pierre and Miquelon; 4, in the Caribbean sea, Martinique, Guadeloupe, Marie-Gallante, Les Saintes, Désirade, and one half of St. Martin island; 5, in South America, French Guiana, or Cayenne; 6, in the Pacific ocean, the Marquesas islands, or Mendana archipelago, the Loyalty islands, and New Caledonia. Tahiti and dependencies, the Touamotou islands, the Gambier islands, Toubouai, and Vavitou, all in Polynesia, and Cambodia in Further India, are under French protection. The population of Algeria in 1872 was 2,414,218; the aggregate population of the other French colonies amounted in 1872 to about 2,300,000; that of the protected countries to 1,024,000. The aggregate area of the colonies was estimated at 422,000 sq. m.; that of the protected countries at 85,500 sq. m.—France, which comprises the largest part of the country known in ancient times as Gallia Transalpina (see GAUL), owes its name to the Franks, one of those confederations of German tribes that invaded and dismembered the Roman empire during the period between the 8d century and the end of the 5th. They were probably inhabitants of the country about the lower Rhine, united with those living near the mouth of the Weser. Crossing the former river, they settled in the northern part of Belgium under various chiefs, and, after a long and violent struggle with the Romans through several centuries, during which they were often completely driven back, successful conquest brought them gradually to the banks of the Somme. Meanwhile other hordes of barbarians had taken possession of several other provinces of Gaul; the Burgundians had peacefully shared the eastern part of this country with the Gallo-Romans, while the Visigoths, already masters of nearly the whole of the Spanish peninsula, extended their military rule over the population of Aquitania. The cities of Armorica had formed themselves into a confederation, and the central part of Gaul from the Somme to the Loire was alone held by the Romans. Such was the condition of the country about 481, when Khlodwig or Clovis, a young man, supposed to have been the grandson of Meroveus, from whom the Merovingian dynasty took its name, succeeded to the rulership over the Frankish tribe living in and around the city of Tournay. In 486 this king invaded the Roman province, conquered the governor, Syagrius, at Soissons, and thus secured to himself the possession of the whole country to the Loire. Ten years later, after forcing back to Germany some rival tribes which had crossed the Rhine in the hope of dividing the spoils with the Franks, Clovis,

yielding to the entreaties of his wife Clotilda, consented to be baptized, and henceforth all the Catholic bishops of Gaul were enlisted in his cause. Their powerful influence helped him greatly in consolidating his authority among the Gallic population, and carrying his conquests southward. A single victory won in 507 at Vouillé over the Visigoths, who were Arians, gave him the possession of nearly all Aquitania. On his death in 511 his kingdom extended from the banks of the Rhine to the Pyrenees, thus including the whole of Gaul, with the exception of the province occupied by the Burgundians, the Mediterranean shore, which had been retained by the Visigoths through the aid of Theodoric, king of the Ostrogoths, and the peninsula of Brittany. This kingdom, although partitioned among the four sons of Clovis, was soon increased by the conquest of Burgundy (about 534); and Khlothar or Clotaire I., the youngest of those princes, surviving his brothers and nephews, could for a while (558-561) boast of possessing a larger empire than his sire. A new division among his own sons brought on long civil wars between the eastern Franks or Austrasians, between the Rhine and the Meuse, and the western Franks or Neustrians, who lived W. of the latter river. The Burgundians, who under their new masters had preserved their name, sided alternately with the one or the other; while the Aquitanians, taking no interest in a conflict among their barbarian conquerors, were little affected by it. This bloody period, in which two women, Brunehaut and Fredegonda, figured conspicuously, extended over the latter part of the 6th century and the beginning of the 7th (567-613). It ended with the defeat of the Austrasians; and Clotaire II., who at its close ruled over the conquering nation, during the latter part of his reign held the whole of the Frankish dominion under his sceptre. So did his son Dagobert (628-638), who had a taste for magnificence, and took as his principal minister Eligius or Éloi, the most celebrated silversmith of his time, who was canonized as a saint. His successors were mere phantoms of royalty, and have been styled "lazy kings" (*rois fainéants*). They still preserved the royal title, while the power was wielded by the mayors of the palace, who, from the condition of private officers of the king's household, had by help of the aristocracy risen to the rank of prime ministers in each of the three kingdoms, Austrasia, Neustria, and Burgundy, of which the Frankish dominion consisted. Through their rivalry the old contest between the Austrasians and the Neustrians revived; and notwithstanding the political talents displayed by Ebroin, mayor to the sons of Clovis II. (660-681), the Neustrians were at length controlled by the mayors of Austrasia, who soon took the title of dukes, and finally acquired absolute possession of the Frankish kingdoms. Pepin of Héristal, the most illustrious among

these nominal ministers and real monarchs, governed them in the name of several successive kings. After his death (714), his natural son Karl, celebrated under the name of Charles Martel, seized and wielded with an iron hand a still more extensive power. He especially signalized his reign by defeating the Saracenic invaders of France between Tours and Poitiers in 732. Twenty years later (752) his son Pepin the Short confined the last of the Merovingians, Childeric III., within the walls of a convent, and, with the consent of the clergy and the approval of the pope, assumed the title of king. His father and himself, the first two princes of the Carolingian dynasty, raised the Frankish power to its highest pitch. Pepin (752-768), firmly establishing his authority all over Gaul, forced into complete submission Aquitania, which during the reign of the *rois fainéants* had succeeded in maintaining its independence, and conquered Septimania, a province along the Mediterranean shore, which had been held by the Arabs of Spain. He made his influence also felt in Italy, where the Lombards became his tributaries, while his liberality toward the pope brought to his side the agency of religion. His son, Karl the Great or Charlemagne, following the same policy, showed himself the most faithful protector of the holy see, overthrew the Lombard monarchy, and placed the iron crown upon his own head in 774; waged for 32 years (772-804) a merciless war against the Saxons, who were finally subdued and compelled to embrace Christianity; destroyed the last remnants of the barbarous Avars who had settled in Hungary; and tried his arms against the Moslems of Spain. He thus made himself the master of an empire which included not only Gaul, but also Germany to the Saale, the largest part of Italy, and N. E. Spain. He styled his dominion the "new empire of the West," and was crowned emperor by the pope at Rome in 800. He aimed indeed at a complete restoration of the ancient Roman empire by marrying the Byzantine empress Irene; but this was prevented by revolutions at Constantinople. He greatly advanced the civilization of his realm by establishing schools and patronizing science and literature, and gave his court a world-wide fame throughout his reign. His son, Louis le Débonnaire (814-840), a weak and superstitious prince, was peculiarly unfitted for the heavy task which devolved upon him; and the selfish ambition of Louis's successors hastened the national and social disruption. Less than 80 years after Charlemagne's death his empire was divided into three kingdoms by the treaty of Verdun (843), and 45 years later (888), through the imbecility of his great-grandson, Charles the Fat, it had entirely fallen to pieces. From its fragments were formed the kingdoms of France, Italy, and Germany, with the secondary states of Lorraine, Burgundy (for a time known as the kingdom of Arrelate or Arles), and Navarre. Amid the convulsions which led to this consummation,

the power of the nobles had been rapidly increasing; the dukes and counts, who had been at first mere officers of the kings, had succeeded in making their dignities hereditary; and Charles the Bald, just before his death in 877, not only sanctioned their pretensions, but extended the principle of inheritance to all the fiefs. Such was the foundation of the feudal system, the origin of which may be said to coincide with the beginning of France proper. The name France first appears in history about the 9th century, and applies to the country W. of the Scheldt, the Meuse, the Saône, and the Cévennes; and henceforth we distinctly see a French nation forming by the fusion of the Frankish with the Gallo-Roman element, and a new language, a mixture of the German and the Latin, sprang up at the same time. The Carolingian family were soon opposed by national princes who had courage and talent; and after a struggle which went on during the latter part of the 9th and nearly the whole of the 10th century, they were finally deprived of their hereditary throne. Previous to this a new race, the Normans, had established themselves in N. W. France. They had carried on a system of piracy along the coast as early as the reign of Charlemagne, and since then they had several times pushed their incursions into the very heart of the country. The weak Charles the Simple at last had recourse to concessions to check their continued attacks, and in 912 the lands situated W. of the lower Seine were ceded to Rollo, the chief of a large horde of these Northmen, and Normandy soon became one of the most flourishing and best regulated provinces in France. Its dukes held the first rank among the feudal princes, when Hugues or Hugh Capet, the duke of France, on the death of Louis V., collected an army, seized the throne, and assumed the title of king (987), founding the Capetian dynasty, which ruled continuously more than 800 years through several collateral branches, and is still represented by the Bourbon family. This ruler and his immediate successors pursued a quiet and conservative course, and though taking little part in the great events which occupied the rest of Europe in their time (the earliest crusade, &c.), they fortified their own power and upheld their royal supremacy, which during the 12th and 13th centuries was established on a solid foundation by kings of considerable ability. Louis VI. (1108-1187), a king of great activity and bravery, forced many of the nobles into submission, and greatly strengthened the royal power. Philip Augustus (1180-1223), the most sagacious prince of his time, nearly doubled the royal domains. Besides Normandy, Touraine, Anjou, Maine, and a large part of Poitou, which he seized by force, after confiscation had been adjudged by parliament against King John of England, who held them by inheritance, he acquired by various means the counties of Artois, Vermandois, Valois, Auvergne, and other territories. The

count of Flanders vainly allied himself with the English king and Otto IV. of Germany. Philip gained over his combined enemies a brilliant victory at Bovines in 1214; and thenceforth the royal power was paramount. France, though long distracted in the south by the Albigensian struggles, was thus enabled to play a conspicuous part in European affairs; and the rank to which Philip's policy raised her was fully maintained by the wisdom of his grandson, Louis IX. (1226-'70). The traditional policy was followed under his reign; treaties and marriages were concluded which secured the ultimate possession of Languedoc and Provence, while the commons, or the third estate, as it was then called, was placed under the more immediate control of the king. The introduction of the Roman law and the regular constitution of the parliament, forming a high court of justice which was to supersede gradually all feudal jurisdictions, were important additions to the efficiency of the royal power; the limitation and definition of the powers of the church, through Louis's pragmatic sanction in 1269, was another step in this direction; while the king's personal good qualities conciliated the respect and affection of the nation. The influence thus secured for the royal title was sustained by Louis's successors, Philip III. and Philip IV. (the Fair), who, though greatly inferior to their ancestor in ability, completed the monarchical system that was to prevail for several centuries. They leaned more than ever upon the third estate in order to counterbalance the ascendancy of the two privileged orders. Men of low birth had already been introduced into the parliament; under Philip IV. (1285-1314) their influence increased, and representatives of the third estate were admitted to the general assemblies of the nation, which before had consisted only of deputies from the clergy and the nobility. The chief events of Philip's reign were his quarrel with Pope Boniface VIII., by whom he had been excommunicated, but whom he finally overcame and took prisoner; the removal of the papal see to Avignon; and the suppression of the order of knights templars, whose immense possessions in France were confiscated to the crown, while the knights were banished, imprisoned, and many even executed under circumstances of the greatest cruelty. Philip was succeeded in turn by Louis X., Philip V., and Charles IV. The Capetian kings, whatever may have been their faults and personal shortcomings, succeeded in giving so powerful an organization to the kingdom as to enable it to stand the brunt of the foreign and civil wars which were to threaten its existence under the younger branch of Valois (1328-1589). The rivalry between France and England, consequent upon the accession of Duke William of Normandy to the throne of the latter, had already been the cause of occasional hostilities between the two nations; it came to a decisive crisis during the first half of the 14th century.

On the direct branch of the Capetians becoming extinct by the death of Charles IV. without male heirs, Philip of Valois, both by right of relationship and by choice of the peers, succeeded to the throne, beginning the Valois dynasty; but Edward III. of England, by virtue of hereditary right derived from his mother's side, claimed not only such provinces on the continent as had been taken from his ancestors, but the whole kingdom of France. In this way began that protracted conflict which French historians call the "hundred years' war" (1337-1453), a period covering the reigns of John II. (1350-'64), Charles V. (1364-'80), Charles VI. (1380-1422), and the greater part of the reign of Charles VII. (1422-'61). Twice France was on the eve of becoming a dependency of the English crown. In 1340 an English fleet destroyed the naval force of France at Sluis, on the coast of Flanders; in 1346, at Crécy, the English archers won an unexpected victory over the flower of French chivalry; and ten years later, at Poitiers, the Black Prince not only defeated King John, but made him prisoner. The states general were also the scene of a deadly struggle between the regent and the third estate, so that royalty itself was put in jeopardy; companies of adventurers and mercenary troops ravaged the provinces; the peasantry of several districts, driven to despair by the oppression of their lords, broke out into a fearful insurrection, which was named the *Jacquerie*, and marked by all the horrors of a servile war. Charles V., by his vigorous policy, succeeded in quelling internal disorders; and with the help of his great constable, Du Guesclin, he regained in a few campaigns all the English acquisitions in France, with the exception of a few important seaports. When both died, in 1380, the kingdom was in a fair way to regain its former prosperity. But the minority of Charles VI., and his subsequent derangement, again plunged France into a series of calamities. The conflict between the various classes of society was renewed with increased fury; rival factions, headed by princes of the royal family, the dukes of Orleans and Burgundy, waged against each other a war of treachery and assassination; while the English, encouraged by the forlorn condition of their enemy, again invaded France. For the third time the French chivalry suffered defeat at Agincourt (1415). John the Fearless being treacherously murdered by the Orleanists or Armagnacs, in an interview which was intended to bring about peace, Burgundy, that is, the N. E. part of France, threw itself into the arms of the English. An insane king, a queen of foreign origin impelled by her unnatural hatred to her son the dauphin, and a prince carried away by his thirst for vengeance, concluded the famous treaty of Troyes, 1420, by which the royal inheritance of France was delivered up to her deadly enemy. Henry V. of England, on marrying the princess Catherine, was appointed heir to Charles VI., and meanwhile

was to assume the power of regent. France seemed now to be irretrievably lost; but the country suddenly rallied its forces, chiefly under the leadership of Joan of Arc, by whom the national enthusiasm was roused to the highest degree, and succeeded in defeating the English power. The disinherited son of Charles VI. was now triumphantly conducted to Rheims to receive there the royal unction (1429); but it required 24 years more of constant warfare to finally drive the invaders from the country. This was accomplished in 1453, with the exception that the seaport of Calais remained in English hands, to be retaken 105 years later. After these long trials, France was at last enabled to exercise her recuperative powers; her population increased at a rapid rate, industry and art flourished, and the last vestiges of the past calamities disappeared. Meanwhile her kings had returned to their traditional policy of enlarging the royal domains and consolidating the royal power by the destruction of the feudal aristocracy. To this task none applied himself with greater zeal than Louis XI. (1461-'88), the son and successor of Charles VII. Many nobles of every rank were delivered to the executioner. The most powerful of all, Charles the Bold, duke of Burgundy, against whom Louis had long carried on intrigues by every means in his power, fell in a conflict with the Swiss allies of the duke of Lorraine, before Nancy, in 1477; the king at once seized upon part of the large inheritance left by that formidable vassal, and the duchy of Burgundy and Picardy were thus annexed to the crown. The fine provinces of Anjou, Maine, and Provence, besides claims upon the kingdom of Naples, were bequeathed to Louis by the last prince of the house of Anjou; the king of Aragon resigned to him the counties of Roussillon and Cerdagne; and France, reaching thus her natural frontiers toward the south and the southeast, became one of the great powers on the Mediterranean. On the northwest, by the marriage of Charles VIII. with Anne of Brittany, she gained possession of that large province, which had hitherto been nearly independent. Under Charles VIII., the son and successor of Louis, a French force invaded Italy in 1494, and conquered the kingdom of Naples without opposition; but the conquest was lost still more quickly than it had been gained. This was the first of a long series of Italian wars in which France was almost constantly engaged for more than half a century, with varying success, and under several monarchs. With Charles VIII., who died without male heirs in 1498, the direct line of Valois ended, and Louis, duke of Orleans, the nearest heir to the throne, and grandson to a brother of Charles VI., became king under the title of Louis XII. This monarch, who at first met with some success in his Italian campaigns, tried all the arts of diplomacy to secure his conquests; but he was no match for the Italian politicians of the 16th century, and still less

for the crafty Ferdinand of Aragon. By the latter he was expelled for ever from Naples, of which he had partly taken possession, while Pope Julius II., the republic of Venice, and the princes of Italy, availing themselves of Spanish, German, and even English alliances (forming at one time what was called the holy league), forced him out of the duchy of Milan, which he claimed in right of his grandmother, Valentina Visconti, and which he had twice conquered. Francis I., the successor and distant relative of Louis, in his turn appeared in Italy as a conqueror, and his first victory at Marignano or Melegnano (1515) seemed to forebode permanent conquest; but he was opposed by the emperor Charles V., and after his disastrous defeat at Pavia in 1525, he was carried a prisoner to Madrid. Here, in order to regain his freedom, he agreed, in January, 1526, to a treaty, by which he forfeited Burgundy and all claims to Naples, Milan, Tournay, and Arras. But no sooner was he set at liberty than he secured from the pope his release from the oaths binding him to this arrangement, and concluded with the holy see, the duke of Milan, and the republic of Venice the second holy league. In 1527 Henry VIII. of England was induced to join the alliance. But the results of the struggle that followed were unfavorable to the French. Pope Clement VII. was forced to conclude an accommodation with the emperor, and Francis was compelled to acquiesce in the so-called "ladies' peace," concluded at Cambrai (1529) by female relatives of the contending monarchs, which was but little less disastrous than that of Madrid. In the mean time, and while the wars between the king and Charles V. had been in progress, a new force had appeared in European politics. The reformation had begun, and the emperor was now obliged to turn his attention to Germany. During the two or three years following the peace of Cambrai, the dissensions in that country afforded Francis an opportunity of weakening his rival by more or less directly encouraging the Protestant princes there in their hostile attitude toward the imperial power. The French army was also strengthened during this period; an alliance was concluded with England in 1532; and in 1536 the war again broke out, after Francis had in vain endeavored to persuade Charles to a peaceable acknowledgment of his Italian claims. A severe struggle followed; and though a peace for ten years was signed at Nice in 1538, and the ministers of Francis strove to keep it, various incidents led to a renewed hostility, and in 1542 the conflict again began. It soon took an unfavorable course for the French; the emperor had by 1544 so far invaded French territory that he even threatened Paris; and in September of that year the peace of Crespy put an end to the war during the life of Francis; for so exhausted were the resources of the kingdom that no further campaign could be undertaken before that king's death in 1547. His son and suc-

cessor, Henry II., the first part of whose reign was occupied with a war against England, renewed in 1552 the struggle against the Hapsburgs, which continued with brief intermissions till 1559, when the peace of Cateau-Cambrésis gave to it a decidedly favorable termination for the French. The English, who had allied themselves with the enemy, gave up by this treaty their last possessions in France. In the last years of the conflict, however, Henry II. had allied himself with the Protestant princes of Germany, and had thus in some degree, though unwillingly, favored the spread of the Protestant ideas in France, where Calvinism had already gained a wide-spread influence among the people, and had found many adherents among the nobles. Both Francis I. and Henry II. had attempted to check the progress of the new beliefs, and had resorted to the greatest oppression and persecution to attain this end. Henry's son and successor, Francis II. (1559-'60), so increased these during his short reign as to arouse the Huguenots to self-defence, which they were now strong enough to attempt; and with this period began the disastrous religious civil wars which raged so fiercely in France, and lasted with more or less violence till 1598. No fewer than eight such wars were waged during the reigns of Charles IX. and Henry III., a period of 28 years. The Protestants held their ground with tenacity; the most illustrious among their chiefs, Admiral Gaspard de Coligni, accomplished wonders; but thoroughly honest and too ready to confide in the honesty of others, he permitted himself to be deceived by the fair promises of Catharine de' Medici, Charles's mother, and with thousands of his companions was treacherously murdered on St. Bartholemew's night, 1572. This fearful massacre did not however annihilate the Protestants, who continued the struggle against the holy league or Catholic union, which had been organized for the better protection of the Catholic church in France, and which was upheld by the pope as well as Philip II. of Spain. The head of the league, Duke Henry of Guise, secretly aimed at the crown, and his popularity seemed to warrant his success, when Henry III. during the session of the states general at Blois, in 1588, had him despatched by his body guards, known as the "forty-five." A few months later, in 1589, the king himself fell by the dagger of the fanatic Jacques Clément, leaving his crown to Henry of Navarre, the head of the family of Bourbon, and the leader of the Protestants. The struggle henceforth took essentially a political turn; and Henry, joined by but a few of the Catholics who had served his predecessor, and much reduced in circumstances, had great difficulty in making good his claims to the crown. His personal qualities and bravery finally conciliated many of the Catholic royalists, but he could hope to be recognized as king by the majority of the nation only on his conversion to Catholicism. To this he assented, July 25, 1593;

and now his whole attention was given to the pacification of his kingdom. This he effected by concluding with Spain the treaty of Vervins, May 2, 1598, upon the conditions of the old treaty of Cateau-Cambrésis, and by publishing the celebrated edict of Nantes, which granted to the Protestants full religious liberty, admission to all offices, and several places of security, among others the strong city of La Rochelle. Henry, having thus inaugurated the Bourbon dynasty, now devoted himself entirely to the work of healing the wounds which had been inflicted on the country during nearly 40 years of bloodshed and devastation. Assisted by Sully, his friend and minister, he restored order in all branches of public service, and effected great improvement in the condition of the people. He then returned to the old policy of Francis I., and meditated the humiliation of the house of Austria; great preparations were made for the enterprise, and Henry was on the eve of his departure for the army, when he was assassinated by Ravalliac, May 14, 1610. This calamity interrupted for nearly 15 years the progress of the kingdom at home and abroad. Under the regency of Henry's widow, Maria de' Medici, mother of Louis XIII., disorders were renewed; the public treasure was recklessly wasted; and the kingdom was distracted by war between the queen mother and the young king, soon after the latter reached his majority. Happily a great minister, Cardinal Richelieu, took the reins of government in 1624, consolidated the power of the monarch at home, and, partly reviving the political designs of the late king, threw the influence and arms of France into the European conflict called the thirty years' war. While annihilating the political power of the French Protestants, he energetically supported the German Protestants in their struggle against the house of Austria; to this end he spared neither money nor troops; and on his death, in 1642, the rival of France had been already many times humbled. The successor of Richelieu, Cardinal Mazarin, pursued the same policy; and the first years of the reign of Louis XIV., who ascended the throne as a child in 1643, were marked by brilliant victories, most of them won by the young duke d'Enghien, afterward the "great Condé." The treaty of Westphalia in 1648 not only asserted the triumph of religious and political liberty in Germany, but the victory of France over Austria, a victory which added to her territory the province of Alsace. The troubles of the Fronde, a faint image of the old civil wars, detracted nothing from the influence gained abroad by the French government, and Mazarin concluded with Spain, in 1659, the treaty of the Pyrenees, which secured two other provinces to France, Artois and Roussillon. This able politician resigned to the hands of Louis XIV. a kingdom well prepared for the full exercise of absolute power. Under this monarch France rose to the height of fortune and glory, while he himself was placed

above all control. From the day of Mazarin's death (1661) he assumed the direction of public affairs, and his ministers, with the exception perhaps of Colbert and Louvois, were little more than clerks, intrusted with the execution of his designs. The first years of his administration were the most useful. Colbert devoted himself to improving all the resources of the kingdom; every branch of revenue became prosperous; and, as at the beginning of the century under Henry IV., the national wealth increased with unusual rapidity. Intellectual progress kept pace with material, and everything conspired to create a literary period of unusual magnificence. A short war against Spain, which was terminated by the treaty of Aix-la-Chapelle in 1668, scarcely interrupted this happy commencement; but it had awakened suspicions among the neighboring powers, and a triple alliance was formed between Holland, Spain, and England. Scarcely four years had elapsed when Louis XIV., at the head of more than 100,000 men, invaded Holland, which, being deserted by England, could be preserved only by the united exertions of Spain and Germany; the contest lasted six years; the French armies, under Condé, Turenne, and Luxembourg, were victorious in nearly every encounter, while French fleets distinguished themselves against the united naval forces of Spain and Holland. The peace of Nimeguen, 1678, put an end to regular hostilities, but not to the encroachments of Louis XIV., who, inflated by success, seized upon provinces and cities which, according to his own construction of past treaties, belonged to France. Louis had now reached the zenith of his greatness; he had added to his kingdom Flanders, Franche-Comté, the imperial city of Strasburg, and several other important territories; he was feared abroad and respected at home; he was Louis the Great for his subjects, and even his enemies scarcely refused him this title. The league of Augsburg, devised by William of Orange, had united together the emperor, Holland, Sweden, and Savoy, and was joined by England on the revolution of 1688. Louis XIV., who undertook to reestablish James II. on his throne, engaged in a desperate struggle against this powerful coalition, and maintained it for nine years; his armies and naval forces, the former especially, still achieved many triumphs; and when the peace of Ryswick was concluded in 1697, the allies, although they boasted of success, were nearly as much exhausted as their opponent. The war of the Spanish succession, which followed the death of Charles II. of Spain in 1700, was brought about by mere family ambition. A more formidable coalition opposed the schemes of the king, who aimed at placing his grandson upon the Spanish throne; the two greatest generals of their time, Marlborough and Prince Eugene, were at the head of the allied armies; defeat after defeat befell the French forces, and the kingdom seemed reduced to extremities; but after

a contest of 12 years' duration Louis succeeded in his bold undertaking, and by the treaties of Utrecht and Rastadt (1713 and 1714) the house of Bourbon inherited the best part of the Castilian monarchy. The burden which he had borne was, however, far too heavy for his weak successors; he had moreover taxed the energies of France and stretched the royal power to such an extent that a reaction was unavoidable, and had by tyrannical and imprudent acts already introduced many of those abuses and elements of discord which were to have such disastrous results. The 18th century was an age of depression, decay, and ruin for all the institutions, doctrines, and classes that had hitherto commanded respect. Royalty lost its prestige, both through the unbounded licentiousness of the regent duke of Orleans and the king himself, and through the irretrievable corruption or imbecility of its ministers; nobility became degraded; the great constituted bodies fell into general contempt; the national treasury was exhausted; and an uncontrollable spirit of censure and rancor hastened the work of destruction. Even the remedies that were tried, such as the wild financial schemes of Law under the regent, only added to the universal confusion. Politically the French government, controlled in turns by unscrupulous princes, by Cardinal Fleury (who, however good his internal administration, failed to support the national dignity abroad), by the clever and infamous Cardinal Dubois, and by the king's mistresses, gradually sank in the eyes of Europe; and toward the end of Louis XV.'s reign it could scarcely be ranked among the great European powers. The four wars in which France then participated, against Spain (1717-'19), for the succession of Poland (1733-'35), for the succession of Austria (1740-'48), and finally the seven years' war (1756-'63), were productive only of disgrace and disaster. The widespread political degeneracy of the time was in some degree offset, it is true, by the remarkable intellectual activity which made itself felt in all departments of literature, and especially manifested itself in the teachings of that school of philosophy whose social, political, and metaphysical theories so largely affected the course of events during the remainder of the century.—Louis XV. died in 1774, and his grandson Louis XVI. ascended the throne at a period which was perhaps the most inglorious of French history. Carlyle, in one of the opening paragraphs of his "French Revolution," compares the country, as it was left by the dead ruler, to a powder tower about which unquenchable fire was smouldering. "With Pompadourism and Dubarryism, his Fleur-de-lis has been shamefully struck down in all lands and on all seas; Poverty invades even the Royal Exchequer, and Tax-farming can squeeze out no more; there is a quarrel of twenty-five years' standing with the Parlement; everywhere Want, Dishonesty, Unbelief, and hot-brained Sciolists for state physicians; it is a

portentous hour." This description is not exaggerated. The tyranny and lawlessness of the nobles and privileged classes, the burden of heavy taxation and oppression, which rested almost entirely on the lowest orders, the reckless mismanagement exhibited in every branch of the public service, and the unrestrained personal vice and extravagance of those in authority, had driven the great mass of the people into a bitterness of feeling almost beyond description; while the exhausted kingdom, with its recuperative forces apparently destroyed, seemed to be on the verge of financial as well as political ruin. The various abuses that had grown up and increased during nearly the whole century were now at their height, and it seemed evident that a disastrous crisis was approaching. In this condition of affairs Louis XVI. began his reign, undoubtedly with some idea of the state of his kingdom, and with the best intentions toward reform; but, as events proved, without the strength necessary to carry out his good intentions. Maurepas, a man eminently unfit for the work in hand, was placed at the head of the ministry. An attempt to conciliate the people was made by the restoration of the parliament of Paris; but instead of promoting reform, this body proved a positive hindrance to it. Turgot and Malesherbes, associated with Maurepas in the ministry, acted with considerable efficiency in the endeavor to improve the state of affairs, but were deposed through the influence of the court party as soon as they sought to interfere with the immunities of the privileged classes. Similar causes defeated the less earnest efforts of the ministers who followed them in quick succession. Necker, who became minister of finance in 1777, and held the office during the time in which France carried on war against England and in aid of the American colonies, at first seemed to improve matters slightly; but the expenses of the war, the usual opposition of the nobles and clergy to any scheme of general taxation, with other causes, led to his deposition soon after the publication of his celebrated *Compte rendu au roi*. Calonne, who succeeded him in 1783, by extravagance and a reckless contracting of loans, plunged the finances into a more hopeless condition than ever; and in 1786 the king was induced to call together the assembly of notables to consider the state of affairs, and especially to deliberate on certain schemes of Calonne. This assembly, which had before been convened by Henry IV. and Louis XIII., consisted of a number of leading persons selected by the king from all parts of the kingdom; and on this occasion, the last time in French history of its convocation, it included 7 princes of the blood, 9 dukes and peers, 8 field marshals, 22 nobles, and 98 high officials of different classes; 144 members in all. These met in February, 1787; but when Calonne's report revealed to them the extent of the existing debt and deficit, and proposed, with other measures, a land tax from which

the privileged classes should not be exempt, there arose an opposition which compelled his retirement. He was succeeded by Brienne, archbishop of Toulouse; but the notables continued to oppose all plans for general taxation, and in May their assembly was dissolved. Various other methods of raising money were now devised; but the parliament of Paris refused to register the royal edicts ordering their enforcement, and the king only compelled their registration by resorting to a so-called bed of justice. (See BED OF JUSTICE.) The parliament protested, and the king, in anger at this open resistance, banished the members to Troyes, but not before they had issued a spirited remonstrance and a demand that the states general should be convened. This violent act on the part of the king caused general indignation, and partly owing to this, and partly to the necessity for new loans, he retracted it soon after, and in September the parliament returned. The conflicts and disputes that followed its re-assembling, however, led to a new step, the constitution of a *cour plénière*, which should pass upon the royal edicts; and this measure aroused more opposition than ever, the duke of Orleans and several powerful nobles joining the general expression which pronounced it an illegal attempt to entirely set aside the parliament's authority. In the provinces armed disturbances took place. All classes of the people, as well the privileged orders as the rest, now hoped for some amelioration through the calling of the states general; and this was everywhere loudly demanded. The king finally yielded; Brienne was deposed and Necker recalled; and the general assembly of deputies from all the recognized classes, constituting the states general, at last assembled at Versailles in May, 1789; this being the first convocation of such a body since 1614. But the constitution of the new assemblage soon led to unexpected results. The privileged classes, the nobles and clergy, insisted that the meetings of the body and all its deliberations should be conducted with strict regard to the old class distinctions, the three estates meeting and voting separately, as in former times, an arrangement by which the two higher estates would have been enabled to neutralize the action of the commons. For the first time this classification met with the most determined opposition; and in June, on the proposition of a member, the abbé Sieyès, the deputies of the third estate declared themselves the sole body having a right to act as the legislature of France, and summoned the nobles and clergy, as bodies representing only certain classes, to attend their deliberations. At first only eight clerical deputies and no nobles obeyed their summons, and the commons now (June 17) solemnly proclaimed themselves the legislators of the country, and constituted themselves a body under the name of the national assembly (in history specially designated the constituent assembly; see CONSTITUTIONAL CONVENTION).

A day or two later a majority of the clergy manifested a disposition to join them. Aroused by these proceedings, the king made an ill-advised attempt to check the course of events; and on the 20th, when the deputies of the commons, accompanied by many clerical deputies, came to the place of meeting, they found their entrance prevented by a guard of soldiers. In the greatest indignation, they gathered in a tennis court near by, and here took a solemn oath not to dissolve their assembly until a constitution for the kingdom should be decided upon and established on a firm basis. A meeting in the church of St. Louis on the 22d gave them added strength; and when, a few days later, the king appeared before them and, though delivering a half-conciliatory address, insisted upon their dispersing and meeting as prescribed, Mirabeau was unanimously sustained in sending to Louis his famous message: "We are here by the power of the people, and we will not be driven hence save by the power of the bayonet." With these events the revolution may be said to have begun. The financial affairs and other business, to consider which the assembly had been called, had been pushed into the background, and the graver questions as to the rights of the people, the reorganization of government, and individual liberty, with which the American war had greatly aided to familiarize men's minds, now occupied the attention of all France. If the assembly had gone far beyond what had been foreseen, the body of the people, long oppressed, and now excited by the revolutionary clubs and the leaders who spoke to them of a republic, were ready to go much further than the assembly. A great part of the garrison of Paris shared the excited feeling of the populace, and events, of which we shall here give only a brief summary, now followed in rapid succession. The king and his advisers collected a body of troops in Paris, and deposed and banished Necker. On July 12, when the people heard of Necker's renewed dismissal and of his departure from Paris, the popular uprising began. A national guard under Lafayette was formed, and weapons and ammunition were taken from the public arsenals. On the 14th followed the attack and sack of the Bastille. (See BASTILLE.) The people of the provinces speedily followed the example of the Parisians, and popular demonstrations of opposition began in all parts of the kingdom. Louis, who at first sought to conciliate the assembly by recalling Necker, and to quiet the people by confirming Lafayette's appointment, by appearing at the hôtel de ville wearing the tricolored cockade, and by other means, met with only the most temporary success. The assembly, although they had long before, at the order of the yielding king, been joined by the nobles, daily took more decided measures. Schemes of general taxation were adopted; and on Aug. 4 the assembly took the decided step of abolishing all feudal rights and privileges of rank, and made their well known dec-

laration of the rights of men. They debated further upon a form of constitution, and early in September they voted that the legislative power should be vested in a chamber of deputies that should be chosen biennially. On Sept. 21, after violent disputes, they conferred upon the king the right of a suspensive veto with regard to the proceedings of this body. The king accepted these measures. In the mean time the manifestations of popular excitement had continued in Paris with but brief intermissions; and the prevailing scarcity of money and of food, the discussions concerning the royal veto, the flight of many of the higher and most unpopular nobles, and other causes, had kept the excitement at a high pitch. The proceedings at a ball given for a royal regiment at Versailles aroused the populace still more; and on Oct. 5 a vast multitude, comprising a large number of women, with some thousands of *gardes françaises* and national guards, went from Paris thither, and a tumult ensued, which was barely checked by Lafayette's interposition. Daybreak of the 6th witnessed renewed violence; the palace was invaded and several of the king's guards were killed; and the exhibition of popular force resulted in the consent of the king and the assembly to transfer themselves to Paris. The assembly now extended the right of suffrage to nearly all the people, who were to choose electors, who should in turn elect national deputies; decreed the confiscation of church property for the benefit of the state, and the creation of *assignats* (see ASSIGNATS); and passed an act reorganizing the country into departments and smaller divisions. Louis confirmed all these measures; and in February, 1790, he appeared in the assembly, where he was received with considerable enthusiasm, and sought to display a conciliatory and liberal spirit. On July 14 he took the oath of support to the new constitution, with the deputies and other authorities, in the champ de Mars; and for a time it seemed as if a constitutional monarchy would remain established. But the conflicts in the provinces continued and increased; the assembly became more and more sharply divided into contending parties, and the popular orators incited the people to further demands. The details of the history of this period may be found in the biographies of the principal actors in its events; especially in those of Mirabeau, at this time the greatest man of the assembly, and of Marat, Desmoulins, Danton, and others, leaders of the republican clubs, now more than ever powerful. (See especially JACOBINS.) A great part of the army shared the popular feeling; and those nobles who had emigrated (already called *les émigrés*), gathering on the frontiers and seeking to raise troops, added to the causes of the coming storm. The refusal of the majority of the clergy to take an oath of conformity to the civil constitution of their order as prescribed by the assembly led to further troubles; the influence of the clubs in the assembly increased; the

king was compelled to dismiss his ministry. Mirabeau seemed the only man capable of controlling affairs at this crisis. At the beginning of 1791 there was a probability that secret negotiations and his own inclination might induce him to take office under the king and give his most powerful aid to the preservation of the monarchy; but all hope of this was brought to an end by his fatal illness, and he died on the 2d of April, at the most critical moment. In the months which followed the aspect of events grew daily graver. On the night of June 20 the king made an ill-arranged and disastrous attempt at flight from France, intending to escape and ultimately join the forces of the *émigrés*, with whom Austria, Spain, Hanover, Sardinia, and Switzerland had united in a league to resist the revolution. Louis was stopped at Varennes and carried back to the capital. The assembly now fully assumed the executive power; and though the king's flight was not itself made the formal ground of any action against him, with its failure the last vestige of his authority disappeared. Indeed, the assembly formally suspended the royal power until the completion of a new constitution upon which they were engaged—the one subsequently called, from the day of its completion, the constitution of the 8d of September. A multitude, influenced by the leaders of the clubs, gathered in the champ de Mars (July 17) to demand the deposition of the king, but Lafayette dispersed them after a brief conflict. The constitution of Sept. 8 prescribed that the legislative power should rest in an assembly chosen biennially, as had been before voted; and still, as before, the nominal executive authority remained with the king, as did the suspensive veto. Louis took the oath to support this constitution on Sept. 14, and on the 30th the assembly dissolved, after passing a vote for the raising of 100,000 men for the defence of the frontiers. Prussia had on Aug. 27 joined the coalition of powers against France. The regulation which excluded from the legislative assembly (which began its sessions on Oct. 1) all members of the outgoing constituent assembly, and prescribed new elections, had the effect to throw the leadership of the new body into the hands of the more democratic party. Of the 745 members, the majority had been chosen through the influence of the clubs. Almost every shade of democratic opinion was represented, from the earnest and high-minded republicanism of the leaders of the party soon to become famous as the Gironde, to the violent extremes which found expression through men like Lacroix, Chabot, and Couthon. The most important early measures of the session were those which declared the *émigrés* guilty of high treason, and condemned the recalcitrant priests as agitators. Louis vetoed both these measures, and thus greatly stimulated the rapidly increasing opposition to the royal power. An army of 160,000 men was now (December) raised by order of the assembly.

Early in 1792 the property of the *émigrés* was confiscated. The Girondists had gained the complete leadership of the assembly; and in March the king was forced to dismiss his ministers and to form a new ministry from members of this dominant party. Dumouriez held the portfolio of foreign affairs, and, although the only member not a Girondist, was the acknowledged leader. Urged on by him and by the assembly, the king on April 20 reluctantly declared war against Austria; and the long conflict between France and the monarchical powers of Europe was begun. At the news of the first defeats of the French army, the greatest popular excitement broke out in Paris. A series of decisive measures was passed by the assembly in the weeks following; the banishment of the priests and the formation of a force of 20,000 national or federal guards near Paris, acts in direct defiance of the few vestiges of royal power still remaining, were the most important of these. The collection of 20,000 republican troops especially, under the direct influence of the Jacobins (a club composed of the most violent agitators), though ostensibly for the protection of the king and capital, could seem nothing but a threat to Louis, whose body guard the assembly had voted to disband. On June 18 the king dismissed his ministers. On the 19th the assembly was officially informed that he had vetoed both the above named measures. On the 20th a great body of the populace armed with pikes appeared before the meeting place of the assembly, demanded the abolition of the royal veto, forced their way into the hall, read an address in which the king was threatened with death, and afterward marched with violent demonstrations to the Tuileries, which they found prepared for defence, and protected by national guards with cannon. No force being employed against them, however, they pressed into the palace, and for an hour the king, the royal family, and their adherents were exposed to the greatest danger. Pétion, mayor of Paris, at last succeeded in dispersing the mob. In spite of all efforts the leaders of this movement were not punished; affairs grew daily graver, both at home and abroad. The assembly now took more and more decisive measures, and on July 5, after Vergniaud's famous speech (*La patrie est en danger*), they swept away the last remains of even formal power from the king by decreeing solemnly "the country in danger," declaring themselves the permanent ruling body, calling the people to arms, and establishing a kind of exaggerated martial law throughout the nation. By the 1st of August all seemed prepared for a violent crisis. The people had been further excited against the king by a foolish proclamation of the duke of Brunswick in his favor, and by the entry of the Prussian army into Champagne; the more violent party had rapidly gained the upper hand in the assembly and in Paris among the populace, where multitudes

of armed men were in constant movement, ready to "enforce the will of the people;" their real leadership was in the hands of the men who had established themselves as the representatives of the Paris sections at the hôtel de ville, and who later, on the night of the 10th of August, laid aside all pretence of subjection to the regularly constituted authorities and formed themselves into an insurrectionary commune. (See COMMUNE DE PARIS, I.) All was ripe for a violent uprising, and on the night of Aug. 9-10 the outbreak came. Summoned by the ringing of bells and the drum roll beaten in the streets, a force made up of the more violent classes of the populace and a comparatively small proportion of national guards collected and took up their march, hastily formed into columns, against the Tuileries. A part of the guard posted about the palace affiliated with them and compelled the opening of the gates from within; the king allowed himself to be persuaded to seek safety in flight to the meeting place of the assembly; the Swiss guard alone began a defence which seemed likely to be successful. Suddenly they received from the king a message commanding them to cease all resistance and retire to their barracks. They obeyed, and gave up their posts. The assailants, however, now renewed the attack with greater fury, the combat became a massacre, and four fifths of the Swiss were butchered. In the assembly, where Louis had taken refuge, the greatest excitement meanwhile prevailed. At the proposal of Vergniaud two acts were passed, one providing for the calling of a national convention to assume the full power of government, the other temporarily suspending the king from all authority, and providing for his transfer to and virtual imprisonment in the Luxembourg; this destination was next day changed to the Temple, to which Louis and the royal family were taken on the 13th. The Paris commune, which had been the moving cause and director of the acts of the 10th, was now at the real head of affairs, and could force the assembly into merely following its wishes. Acts of an even more violent nature speedily succeeded. A special commission was organized with power to arrest and try all those who might be under suspicion of opposing the "welfare of the country," and those who were called "the conspirators of the 10th of August" (the royalists and defenders of the Tuileries); and this first of the revolutionary tribunals soon brought about a perfect reign of lawlessness. The priests who had refused to take the prescribed oath were sought out and imprisoned; and under Danton's leadership the commune exercised unlimited control over life and property. In the meantime the news of the Prussian advance through Lorraine increased the excitement. The news of the taking of Verdun produced a climax of violence. The populace committed the wildest excesses; troops of armed men entered the

prisons where the priests and other suspected persons were confined, and there, on Sept. 2, began the slaughter known as the September massacres. It is estimated that between 1,300 and 1,500 prisoners were put to death. In the provinces similar though less important acts were committed. On Sept. 21 the newly elected national convention took the place of the legislative assembly. In this new body the Jacobins and more violent agitators were greatly in the majority, and their party, called "the Mountain" from its occupying the elevated seats in the hall, far outnumbered the Gironde, which now represented the more conservative element; besides these definite parties, a large part of the convention occupied an indecisive middle ground. On Sept. 25, on the motion of Collot d'Herbois, France was enthusiastically proclaimed a republic, and the convention at once entered upon a series of decisive measures against all relics of the old régime. The fortunes of the war on the frontiers had meanwhile changed; the Prussians had retired, the French under Dumouriez entered Belgium, Montesquieu pressed into Savoy, and the force under Custine captured several important positions on the German frontier. The party of the Mountain and the popular leaders took the credit for these successes; their influence was greatly increased; and, urged on by them, events now rapidly took the direction, toward which they had long been tending, of more violent personal measures against the king. On Dec. 11 Louis was brought to trial on various charges, and after a long and intensely exciting trial he was sentenced to death on Jan. 20, 1793, and on the 21st was guillotined in the place de la Révolution (now the place de la Concorde). France was now speedily involved in an almost inextricable confusion. Insurrections took place in all parts of the kingdom; in the Vendée, from the beginning the seat of formidable royalist uprisings, the most violent disturbances broke out, and threats were made of advancing on the capital. England, by whose government the French ambassador was dismissed immediately on the news of the king's execution, united with the German empire, Holland, Spain, and Naples, against the revolutionary government of France. Paris itself was soon under the rule of an organized terrorism, at the head of which were Danton, Marat, Desmoulins, and their associates. A revolutionary tribunal and a "committee of public safety" were formed (March 10 and April 6), which were endowed by the convention with what was in effect an absolute power over persons and property. The law securing to the members of the convention immunity from personal arrest and injury was shortly afterward repealed; undoubtedly this was brought about as a preliminary step to the effort soon to be made to destroy the Gironde, between whom and the new leaders of affairs there existed the bitterest conflict; a conflict

to be intensified when a violent quarrel put an end to a temporary affiliation which Danton had made with the Girondist leaders. Their fall was finally brought about after a most violent debate, during which several accusations were brought against them and rejected, among others that of having been associated in some way with Dumouriez in his acts. (See DUMOURIEZ.) Bands of the armed mob gathered before the hall of the convention and demanded their punishment, and on June 2 the arrest of the Girondist leaders was decided. They were at first only sentenced to nominal arrest in their own houses; but it was not long before those who did not conceal themselves were seized and imprisoned in the Conciergerie. (See GIRONDISTS.) These acts of the convention produced violent disturbance in the provinces and in many of the large cities of the kingdom, great numbers of the people taking the part of the Girondists and opposing the violence of the new leaders at the capital. But in Paris the terrorists were now fully established in power, and proceeded daily to strengthen their rule by renewed steps against their remaining enemies. The great majority of the people, especially in the provinces, looked upon Marat as the head and life of the terrorists; but when on July 18 he was killed by Charlotte Corday, the error of this belief was seen. The murder, instead of aiding the imprisoned Girondists, only furnished their enemies with another accusation against them; while the real leadership of the party was now obviously, where it had long actually been, almost entirely in the hands of Robespierre, whom Marat's death only left more at liberty to carry out his own plans. On Aug. 10, 1793, still another constitution, and this time a radically democratic one, was adopted, but it was voted that it should not go into actual effect until the end of the war. The convention made great changes in the organization and leadership of the army, and by the most strenuous exertions, and the proclamation of a *levée en masse*, now brought men into the field by hundreds of thousands. In the provinces the conflict with the opposition was carried on with the most relentless cruelty. In the Vendée, among the royalist inhabitants, terrible slaughter was made. In Bordeaux, Marseilles, and Lyons, which had resisted the authorities at Paris, but had been subdued, the most barbarous massacres were perpetrated. Carrier in Nantes invented novel horrors (the *noyades*). Toulon endeavored to escape the fate of these cities by surrendering to the British; but it was recaptured and treated with the same cruelty. Similar measures marked the civil conflict in all parts of the kingdom, the forces of the convention overrunning and ravaging the country. Meantime the war of the coalition against France did not make much progress. The allied powers were embarrassed by complications among themselves. Paris itself had been fairly given over to anarchy; all industry was

at an end, and the mob plundered as it chose, or was "supported" by the government of the commune on the property seized from the rich. Barère had openly declared in an address that "terror was the order of the day." The convention passed a decree (Sept. 17) against all those persons whom it defined as "suspected," and a course of violence that resembled that of the old Roman proscriptions began against those held to be enemies of the new régime. The queen, Marie Antoinette (who had been a close prisoner since the death of Louis), and the imprisoned Girondists, were among the first victims. After a brief form of trial in the first part of October, Marie Antoinette was guillotined on the 16th. The Girondists, after a brilliant defence, were executed Oct. 31. Several acts of the convention strongly marked the prevailing anarchy. By a decree of Oct. 5 the Gregorian calendar was done away with and a new revolutionary calendar introduced, which, by a retroactive provision, was supposed to have begun Sept. 22, 1792. Soon afterward the Christian religion was formally abolished, and the worship of Reason substituted, through the influence of Hébert, Anacharsis Clootz, and their followers—that party in the revolutionary commune which comprised the most violent extremists, and which was already known under the name of the Hébertists or *enragés*. But the "men of terror" now approached the first of those dissensions which preluded their fall. Robespierre, who was rapidly making his way toward nearly absolute power, saw that the acts of the Hébertists would weaken his influence with the populace, and for this and other reasons he desired to be rid of them. Through his influence they were arrested and accused on various grounds, and 20 of them were executed March 24, 1794. Danton and his adherents, including Camille Desmoulins, who now advocated clemency, were the next opponents to be cleared from Robespierre's path; and though the conflict was in this case harder, his influence was sufficient to carry it through successfully. On March 31 the Danton party were arrested, the fear of Robespierre forced the convention to bring accusations against them, and on April 5 they were also brought to the guillotine, leaving Robespierre, with his companions St. Just and Couthon, in power. Under these leaders the order of affairs was again changed. Robespierre introduced still another religion, under the name of the worship of the Supreme Being, proclaiming a solemn fête at its introduction, which was little more than a farcical display of his own egotism. The rule of violence redoubled its horrors and cruelties; indeed, the period now following is that which is generally known especially as the reign of terror. The convention could not refuse the most extravagant commands of the powerful triumvirate; it was even obliged to assent to a proposal giving to the revolutionary tribunal the right to summon before it, without

question, the deputies themselves. The terrible executions *par journées* began, before a reorganized tribunal that was to "act more vigorously" than the former one. These executions were nothing less than promiscuous slaughters of all those against whom the most trifling accusation could be brought forward or invented; 60 to 70 persons, according to the most temperate statements, being daily brought to the guillotine. In Paris alone there are said by good authorities to have been 1,500 executions during the seven weeks through which this state of affairs endured. Such a course could not be long continued, and at length the reaction came. Opposition to Robespierre sprang up within the committee of public safety itself; and when on July 26 he demanded its renewed reorganization, the convention for the first time dared to refuse him. This step gave an opportunity to his enemies to turn against him; and in a single day his almost dictatorial power was gone. On July 27 (9th Thermidor) his arrest was ordered. Paris was now once more in uproar; a violent conflict ensued between the adherents of Robespierre and the troops of the convention, on whose side the sections and the national guards arrayed themselves. At first he was rescued by his party, but their success was only temporary. Their opponents won in the end a complete victory, and on July 28 Robespierre and a great number of the leaders of the terror were guillotined on the same spot where their victims had suffered. With this act of justice an end may be said to have been put to the reign of the proletariat and the worst classes of the Paris population; and the more intelligent citizens began to regain that share of influence of which they had been so long deprived. On Nov. 12 the Jacobin club was closed. The more moderate deputies of the convention, who had fled or been banished, gradually reappeared in Paris. Although insurrections, caused partly by the prevailing want and suffering, partly by intrigues of the former leaders of the mob, broke out from time to time (especially on April 1 and May 20, 1795), they were put down, after sharp conflicts, in one of which (May 20) the convention was driven from its hall for a time. Under the influence of the more moderate opinions that now again gained the upper hand in the convention, a new constitution was formed. This was "the constitution of the year III.," bearing throughout the traces of the return of an intelligent and responsible class to the conduct of public affairs. It provided for the institution of two legislative bodies, the council of 500 and the council of ancients, numbering 250. The executive power was placed in the hands of a directory of five members. But a decree of the convention, by which it prescribed that two thirds of the new assembly of 500 must be chosen from the convention's own members—a measure designed to prevent either royalists or ultra democrats from controlling the new body—gave rise to a new

and formidable uprising, in which parties were most singularly divided. The royalists, hoping to seize this opportunity to regain power and prepare the way for a restoration of the monarchy, were those who began this insurrection and the conflict against the convention; the middle class (*bourgeoisie*), fearing the return to power of the extreme democrats, joined the royalists; and the convention had upon its side the army and the populace of the suburbs, the once ruling proletariat. Both sides prepared for a violent conflict, the royalist party having much the greater force at command. But the convention placed their troops under the command of Napoleon Bonaparte, then a young general, but of the greatest promise; his skill and determination gave the convention a complete victory (Oct. 5, the 13th Vendémiaire). During the later portion of the revolution, and while these events occurred at the capital, the French army had won some successes in its war with the foreign powers in coalition against it, partly through actual victories, partly through the mismanagement and jealousies in the ranks of its enemies. The results of these successes may be briefly summarized. Prussia, whose troops had been gradually forced to withdraw across the Rhine in 1793, had carried on the war in only a half-hearted fashion during 1794, and, jealous of Austria and not in harmony with the other powers, had withdrawn from the coalition and made peace in April, 1795. Spain had concluded peace in July of the same year. Belgium had been overrun and taken possession of by the French. The Austrians had been forced back across the Rhine; the allied armies of England and Holland had been gradually pushed back, and although during the last few months they had shown renewed energy in the carrying on of the war, they had as yet accomplished but little. Early in September the French army had crossed the Rhine, near Düsseldorf, and penetrated to Frankfort, while another detachment had taken Mannheim. But this last body soon met with a defeat which greatly tended to turn the tide; Mannheim was retaken and the army driven back. In France itself the Vendée was again in insurrection. Such was the state of affairs when, on Oct. 28, 1795, the new government began, the convention having been dissolved on the 26th. (See DIRECTORY.) But the condition of things at first grew rapidly worse. England, Russia, and Austria, in a new coalition, began to carry on a more vigorous warfare. It was not until Carnot's plan for a general offensive movement of the French troops was put in operation, that the current of success was decidedly turned in favor of the French. Bonaparte was put in command of the army which was now to advance against the Austrians from Italy, and the account of the campaign he there conducted in 1796 and 1797, given at length in his biography (see BONAPARTE, NAPOLEON), will show how completely he changed the condition of

affairs. (For other military events under the directory, see HOOCH, JOURDAN, MASSÉNA, and MOREAU.) At the truce of Leoben (April 18, 1797) France controlled all Italy; Austria surrendered all rights in Belgium and recognized those republics which France established. The most important internal affairs during this period were the schemes for financial improvement, which came to but small results. The royalist party had, however, been gradually gaining ground throughout the kingdom, and the directory was constantly absorbed in the endeavor to prevent an outbreak, which, in the prevailing condition of want and general bankruptcy, could not but put an end to its power; an outbreak constantly threatening both from royalists and the democratic party which had risen from the intrigues of the defeated Jacobins. The directory sought to preserve its own influence by using these parties as balances to one another. In the elections of 1797 the royalists made such gains as to give them a majority in the council of 500; and this hastened the approaching crisis. The republicans found their support chiefly in the army; and with the aid of this, Bonaparte being on their side, they prepared and carried out a decisive movement. On the night before Sept. 4 (18th Fructidor) the hall of the council was surrounded by troops and cannon. The Tuileries was occupied with little opposition. The royalist members of the council were arrested, and the remainder of the body pronounced a decree of banishment against them, and declared their elections illegal. The republicans were again in power. On Oct. 17 a formal peace was concluded with Austria at Campo Formio, which confirmed the advantages of the truce of Leoben with some important additions. From this point the history of France becomes so entirely identified for nearly 18 years with that of a single man, that we may refer for all details of that period to the article BONAPARTE, NAPOLEON, and confine ourselves in this place to the briefest summary of events. The brilliant victories of the French under Bonaparte in Egypt and their simultaneous defeats on other theatres of war (1798-'9) prepared the way for those acts which were to make him the ruler of the nation. When, on his return from the East, the young general overthrew the vacillating directorial government with the two councils, and formed a new constitution, his course was generally approved. Chosen first consul for ten years, Dec. 18, 1799, he broke up the coalition which had been formed against France by his victory at Marengo, June 14, 1800; forced Austria and the German empire to conclude the peace of Lunéville in 1801, and England that of Amiens in 1802; and by a concordat with the pope reestablished Christian worship in France. Consul for life, Aug. 2, 1802, then hereditary emperor, May 18, 1804, he reformed and reorganized legislation at home by the formation of the civil code, the organization of

public instruction, and the improvements he introduced in all the branches of public service; while he added to his military and political glory by his triumphs at Austerlitz, Jena, Friedland, Eckmühl, and Wagram, and by the treaties of peace which he signed at Presburg (1805), Tilsit (1807), and Vienna (1809), with the great powers of Europe, successively brought by England into coalition against him. He had now reached the height of his power and glory; he had placed his brothers on the thrones of Holland, Westphalia, and Spain, and his brother-in-law on that of Naples; he thus extended his influence over nearly the whole of western Europe, and became the most powerful ruler of the world. But his insatiate ambition and arbitrary rule were incessant causes of hatred and opposition against him among the sovereigns and the nations of Europe; they did not cease from efforts for his overthrow. His power was shaken by the successful resistance which he met with in the Spanish peninsula (1808-'13); and his prestige was ruined by his disastrous expedition to Russia in 1812. The European nations, recovering their courage, united against him; and their combined exertions inflicted upon him at Leipsic, Oct. 16-19, 1813, a blow from which he never recovered. It was in vain that he accomplished wonders during the campaign of 1814; he could not expel his enemies from the French territory; he was dethroned, and a prince of the house of Bourbon, the brother of Louis XVI., received from the conquerors the sceptre of France, now restricted to her old limits. The sudden return of Napoleon from Elba overthrew this new power; and for 100 days, from March 20 to June 28, 1815, he was again the sovereign of France; but the battle of Waterloo (June 18, 1815) destroyed his power for ever, and the Bourbons, reinstated by foreign bayonets, once more ruled the kingdom. From this time the history of France can be again followed in the biographies of her rulers, of whose reigns we give here but a brief review. Louis XVIII., the first monarch under the restoration, granted a charter to his subjects, and, keeping carefully within the limits of that instrument, died in 1824 in undisturbed possession of his throne, although, in compliance with orders from the holy alliance, he had in 1823 sent a French army to put down the liberal revolution in Spain. His brother and successor Charles X., a man whose character inclined him toward a less liberal government, anxious to take back the little liberty France was enjoying, tried to divert public attention by supporting the Greek insurrection against Turkey (1827-'8) and conquering Algiers (1830). But these enterprises failed to conciliate public opinion, and when the king attempted to suspend some of the most important guarantees secured by the charter, a formidable insurrection broke out, July 27, 1830. Charles was obliged to abdicate; and after a few days' interval the head

of the younger branch of the house of Bourbon, Louis Philippe, duke of Orleans, was appointed "king of the French" (Aug. 9) by the chamber of deputies. The choice, being acceptable to the middle classes or *bourgeoisie*, was maintained; and notwithstanding some occasional outbursts of republicanism among the people, the July monarchy, as it was called, lasted for nearly 18 years. At first Louis Philippe seemed willing to fulfil the expectations of the liberalists, supported Belgium against Holland, and seized upon Ancona to counterbalance the influence of the Austrians in Italy. But by degrees his policy was changed; the government proved reactionary at home and devoid of energy abroad; and the popular favor on which it had relied deserted it. A political manifestation in favor of parliamentary reform brought on another revolution, Feb. 24, 1848; and although the majority of the nation would have preferred the continuation of a constitutional liberal monarchy, the irresistible course of events precipitated them into a republic. (See LAMARTINE.) The middle classes, being apparently resigned to their present fate, professed to be ready to give this new form of government a fair trial; but within a few months the majority of their representatives in the constituent assembly, frightened by socialistic movements and a terrible civil struggle in the capital (June 23-26), gave strong evidence of hostility to it. A so-called republican constitution was adopted, and on Dec. 10, 1848, Louis Napoleon Bonaparte, the nephew of Napoleon I., was elected president of the French republic for a term of four years, by 5,434,226 votes, against about 1,450,000 given to Gen. Cavaignac, who had crushed the June insurrection. (See BONAPARTE, NAPOLEON III.) Internal dissensions, some signs of which were apparent, soon estranged the majority of the legislative assembly, which succeeded the constituent in 1849, from the president; and rumors of revolution became rife as the epoch of a new presidential election approached. The expected revolution took place, Dec. 2, 1851; by a bold stroke of policy the president dissolved the assembly, assumed dictatorial powers, and made an appeal to the people, asking them to sanction by their votes what had been done. The support of the army had been previously secured, and various unconcerned attempts at armed resistance were smothered by energetic and bloody measures. The revolutionary president, who alone controlled the elections, was chosen for a term of ten years by 7,439,216 votes; a new constitution, very much like the consular one framed by Bonaparte in 1799, was promulgated; and finally, on Nov. 7, 1852, the senate made a motion for the reestablishment of the empire; this having been assented to by a vote of 7,824,129 citizens, the empire was proclaimed, Dec. 2, 1852, and Louis Napoleon ascended the throne with the title of "Napoleon III., hereditary emperor of the French by the grace of God and the

will of the people." An unusual financial and commercial activity marked the first years of his reign; the *crédit foncier* and the *crédit mobilier* companies were established in Paris; many important public works were undertaken, and though speculation was unduly encouraged, the general material condition of the country was undoubtedly much improved. On Jan. 29-30, 1853, Napoleon married Eugénie de Montijo. The chief event of the early portion of this reign was the Crimean complication, in which, largely through the influence of Napoleon and his advisers, an alliance was formed by England, France, and Turkey against the demands of Russia, and war was declared on March 27, 1854. Several large public loans were negotiated in open market (almost the first time this had been done in France), to provide for the expenses of carrying on the naval and military operations, and active warfare was almost immediately begun in the Black and Baltic seas and on the Crimean peninsula. The conduct of the war by the French government largely increased the military prestige of the nation, as well as the popularity and strength of Napoleon's rule, especially as during its continuance measures for enhancing the domestic prosperity of the country were by no means neglected. An international exhibition and the meeting of a statistical congress took place in Paris in 1855, and during the same year several personal visits of European sovereigns to the French capital tended to give Napoleon a recognition which was not at first accorded to him. Two unsuccessful attempts at the assassination of the new emperor were, however, made during the same period. On March 16, 1856, the prince imperial was born at the Tuileries. On March 30 peace was concluded with Russia, France coming out of the conflict with the prestige of the first military power of Europe, while the French government also rapidly acquired great diplomatic influence. Napoleon was made arbiter in several important questions between European powers; and he added to his influence at home by taking part in the war against China in the East, and by occupying New Caledonia. In 1858 another attempt was made to assassinate him, on this occasion by Orsini and his fellow conspirators, several of whom suffered death. The affairs of Italy now began to occupy attention, and Napoleon's decision to interfere in Italian matters against the Austrian government, first openly intimated in January, 1859, led to the declaration of war against Austria in May of that year. The conflict which followed, though leaving the affairs of Italy in a somewhat undecided state, added to the French military prestige, and the peace of Villafranca, July 11, 1859, which was confirmed by the treaty of Zürich in November, left France in a position of even greater authority than before in European politics. In 1860 Savoy and Nice were ceded to France by Italy, as had probably been secretly arranged with Victor Emanuel

before the war. This act excited among the other European powers the greatest suspicions of Napoleon's designs, which were not allayed until after his interview with several of the leading German princes at Baden in June, at which he expressed himself satisfactorily to them as regarded his further intentions. During all this period Napoleon had not discontinued his activity in the East, and especially in the colonies. The war in China terminated successfully for the allies, by the capture of Peking in October, 1860. Those gradual aggressions in Further India, which terminated in 1863 in the French occupation of Cochin China and in the establishment of a protectorate over Cambodia (see CAMBODIA, and COCHIN CHINA), had also begun. In 1860-'61 an expedition was sent to Syria to protect the Christians there from such violence as had been exhibited shortly before in the Damascus massacres.—But while the French prestige was greatly increased in the East by these acts and successes, the emperor's schemes for establishing the Hapsburg prince Maximilian on the throne of Mexico ended in so ignominious a failure as to do much toward undermining the opinion of his power that had been held in Europe; nor could the course which European affairs themselves took in the few years next succeeding be other than dangerous to the continued influence of France. The rapid aggrandizement of Prussia was especially regarded with a jealous eye by the French government, and Napoleon in vain endeavored to prevent by diplomatic measures the results which he foresaw from the Schleswig-Holstein war, and the war of Prussia against Austria in 1866. Among these were his efforts to obtain possession of Luxemburg, resulting in the neutralization of that territory. The internal affairs of France during this period had also been of much importance. The conclusion in 1860 of a commercial treaty with England, strongly in the interest of free trade, had created a great excitement and vehement opposition among the manufacturers and industrial classes of the empire, and led to much debate in the corps législatif. In November of the same year an imperial decree made several changes in the powers and rights of the senate and legislative body, which permitted much greater freedom in the interpellation of ministers, and in criticism of the acts of the government. This decree was followed by several other somewhat liberal measures, among them two which placed the vote on the financial budget in the hands of the corps législatif, and also conferred on that body the power over appropriations, &c., which had before been settled simply by an imperial decree. The laws concerning the press were also somewhat lightened; but the tendency toward a more liberal government manifested in these acts of the emperor did not long continue. The decrees concerning the corps législatif, however, permitted the growth in that assembly of an opposition party which

rapidly gained in numbers and influence, was considerably increased at the next elections (1863), and during the decade between 1860 and 1870 contributed greatly to the growth of public opinion against the Napoleonic government. The failing fortunes of the Mexican expedition, the various diplomatic defeats suffered by the emperor in his European negotiations, the endeavors of the government partly to interfere with the elections in the departments, the unsatisfactory management of the finances, and many other causes, combined to rapidly increase this feeling, which, assisted by the publication of political satires and pamphlets, became every day more formidable. The course which Napoleon pursued during the Prusso-Austrian war in 1866 did not tend to restore confidence in him; and the excuses by which his ministers sought to smooth over the obviously vacillating and feeble policy he had pursued during its continuance and after its close, and the open rebuffs he had met with from the Prussian government, rather aided than checked the growing opposition. The year 1867, although the international exposition (which was opened in the spring in Paris with great splendor) made it outwardly appear a prosperous period for the French government, was in reality a time of sharp political struggles at home, and of complications abroad. In the course of the former the members of the opposition in the corps législatif did not hesitate to openly pronounce the imperial policy of the preceding years a failure; and the financial and military measures of the emperor met with but an indifferent support from that body. Among external affairs the "Roman question," the problem of the position of the Papal States in relation to the rest of Italy, had assumed an aspect which seemed likely to require prompt action if the imperial policy was to be sustained. When in the autumn of 1867 an Italian uprising against the continuance of the papal power in Rome occurred, under Garibaldi's influence and leadership, and the government of Victor Emmanuel manifested the greatest hesitancy in undertaking an active interference, Napoleon was driven to more energetic measures. An ultimatum was sent to Florence on Oct. 16, and on the 30th a body of French troops, brought from Toulon by sea, entered Rome; on Nov. 8 they reënforced the papal troops at the battle of Mentana against the Italian forces, and secured the defeat of the latter; and no part of the force was withdrawn until the pope's authority was reestablished. Even then small garrisons were left in Rome and Civitavecchia; and, as much diplomatic negotiation on the part of France with the other great powers did not lead to a settlement of the question which was at the same time satisfactory to the government of Victor Emmanuel and that of the emperor, these garrisons were retained pending the decision of the matter; and they did not finally leave the Italian capital until other and far different events had brought

about Napoleon's downfall, nearly three years later. Among the more important measures of the legislative sessions of 1868 were the new press law, which very slightly increased the freedom of the press; the law greatly enlarging the army, and including provisions for prolonging the term of service and arming the troops; and the provision for a loan, for military purposes, of 429,000,000 francs. The growth of public opinion against the emperor and his ministers was most conspicuous during this year. Republican demonstrations were made both in Paris and in the provinces; Rochefort's *Lanterne* and many other publications aided the growing sentiment; while the trials of several prominent offenders only increased the excitement. The legislative session of the early part of 1869 was chiefly noteworthy for the revelations made during its continuance of the condition of the finances of the empire. The failure of the *crédit mobilier* revealed the unauthorized proceedings of Haussmann, the prefect of the Seine, to whom had been due the great embellishment of the capital during the ten years preceding—embellishments and improvements undertaken largely with a view of giving employment to the more turbulent portions of the working people, but pursued with reckless extravagance, and with complete disregard of the rights and interests of the poorer classes. The exposure of the entirely unauthorized means by which money had been obtained for these and other purposes, and of the general confusion prevailing in financial affairs, created great excitement; and it was only with extreme difficulty that the government carried its measures for the year through the corps législatif. The elections in May resulted, in spite of the most energetic exertions of the emperor's adherents, in the return of a much greater proportion of opposition deputies than had ever before been chosen. The debates in the corps législatif were now of such a nature that Napoleon hastened to ward off a possibly approaching crisis by the promise of speedy liberal measures and reforms, and to prevent further action by causing the adjournment of the body. The promised measures were embodied in the *senatus consultum* of Sept. 6, 1869; but the emperor's failure to convoke the legislature for its new session on the prescribed day led to renewed excitement. On Nov. 29, however, it was finally opened; and its first acts clearly showed the strength of the liberal party. The appointment (in January, 1870) of Ollivier to the premiership and the removal of Haussmann were the earlier events of the session. Great excitement was caused, and popular disturbances were renewed, by the shooting of Victor Noir by Prince Pierre Bonaparte, on Jan. 10, and indignation was greatly increased by the acquittal of the prince in March following. The arrest of Rochefort and the tumults in consequence; the long continued strikes in several great factories, and the discontent of the laboring classes; the delay of the emperor

in giving immediate force to several promised reforms, and the general distrust of his intentions, combined to diminish the at first unusual popularity of Ollivier's ministry. The new government, which had seemed about to introduce in France a constitutional régime, gradually lost the public confidence. In March the draft of a new constitution was submitted to the corps législatif. While it confirmed the measures of reform already adopted, it did not include the hoped-for provision making the ministers responsible to the legislature instead of to the emperor; and it conferred upon the emperor the right to "appeal to the people" to sustain him in his acts; a provision which was generally looked upon as a mere cover for the continuance of the old personal government, and a device for concealing Napoleon's retreat from his promises to give to the legislature that power which it should have in a constitutional form of administration. The new constitution itself was submitted to the people, by this form of "appeal," instead of to the corps législatif. Having been confirmed by a *senatus consultum* (April 20), a *plébiscite* was ordered upon it for May 8. By the most strenuous exertions of the imperialists, and their interference everywhere with the elections, the result was made to show more than 7,000,000 affirmative votes, against fewer than 2,000,000 negative and illegal ballots. The large cities cast a great proportion of the negative votes; in the army and navy 47,000 persons voted "No." In spite of this result, the situation of internal affairs was extremely grave; and it is not to be doubted that, in the hope of warding off a more serious crisis, Napoleon rather favored than retarded the progress of those foreign complications which, in the early summer of 1870, began to assume a threatening aspect.—For a considerable period indefinite rumors of a possible alliance between France and Austria against the increasing power and pretensions of Prussia had agitated European diplomacy. Of late they had gained in distinctiveness. The position of Austria did not appear decided, but in France unmistakable manifestations of a hostile spirit on the part of the government were made; chief among them, perhaps, was the appointment to the ministry of foreign affairs of the duke de Gramont, well known for his hostility to Prussia. Hardly had this appointment been made when an unexpected event occurred, which hastened the rapidly increasing complications, and furnished what was taken by the French as an immediate cause of war. This was the declaration of the candidature of the Hohenzollern prince Leopold for the throne of Spain. On July 6 Ollivier and Gramont declared in the corps législatif that such a candidature, agreed upon without the knowledge of the French government, could not be permitted by France. The greatest excitement against Prussia followed, both in the corps législatif and among the people. The voluntary withdrawal of Prince Leo-

pold did not end the matter. Benedetti, the French ambassador to the Prussian court, who had before been instructed to request the king of Prussia to command Prince Leopold's retirement from the candidature, was now instructed to demand of that monarch an explicit promise that no prince of Hohenzollern should ever in the future be a candidate for the Spanish crown. This demand, especially when pressed upon the king (who was then at Ems) in an unwarranted and even insolent manner, was decidedly refused (July 18). The king denied to Benedetti another interview; and the latter was recalled by Napoleon, while Prussia immediately withdrew her representative from the French court (July 14). Five days later, and after the failure of the proffer of mediation made by England and also by the pope, war was formally declared by France (July 19). The short time elapsing between the first public warnings of approaching hostilities and this formal declaration had been sufficient to permit popular enthusiasm in both countries to rise to the highest pitch; but in the matter of actual military preparations the two nations found themselves, as events proved, in widely different conditions. In France, where measures for the increase and reorganization of the army and for the improvement of the military situation in all respects had occupied for several years a considerable part of the attention of the legislature, the preparation for a possible war had been perhaps more conspicuous than in the North German confederation; but so much less thorough in many respects had been the carrying out of the French military system that its results did not bear out the estimates upon which both people and government relied. The French army at the beginning of 1870 nominally numbered on a peace footing about 400,000 men; it was supposed from the estimates that it could be raised on a war footing, and including the national guard and all branches of the service, to nearly twice that number. That these expectations, however, were based upon exaggerated estimates of the numbers as well as of the immediate availability of the troops at command, appeared at the very beginning of military movements. The number of troops in the active army at the disposition of France at the beginning of the war was, according to the best military authorities, about 427,000; there were about 87,000 regular reserve troops in addition to these; and the entire force of men who, besides all those just named, could still be called out in the most extreme emergency (chiefly those employed in garrison duty), was about 157,000. The active or field army, which it is alone necessary to consider at this time, had been rapidly prepared for war for several months before the declaration. The preparation of munitions and the purchase of horses and provisions were carried on with great energy throughout the months of May and June; while the organization of the line and the as-

signments of officers to its divisions and brigades were at the same time pushed forward. Yet so defective had been the arrangements of the government that the outbreak of hostilities found the army in great part unprepared, while the preparations for their mobilization were in the most incomplete condition. The "army of the Rhine," the first portion of the active force which was in any way ready for service, was pushed forward as rapidly as possible to the Rhenish frontier; but most of its munitions and equipments, instead of going forward at the same time, followed at irregular intervals; and the troops, arrived at their destinations, were subject in consequence to the most fatal delays. The whole strength of this first active army that appeared in the field did not exceed, by the highest estimates, 310,000 men; and of these probably not more than 270,000 constituted the "army of invasion," with the advance of which at the frontier actual hostilities began. In contrast with this state of affairs, the military system of Germany exhibited the greatest advantages. Not only did the immediate support of the South German states (upon whose neutrality, if not upon their positive opposition to Prussia, Napoleon had undoubtedly relied) enable King William to bring into the field an active army more than one third greater than that of France; but the perfect organization which prevailed especially in the Prussian, and in less degree throughout the whole German military force, enabled him to do what was of perhaps even more importance, concentrate immediately on the frontier a well disciplined, perfectly trained, and completely prepared body of men; anticipating the movements of the enemy by taking advantage of his delay. Directly after the declaration of war, Germany found at its immediate disposition an active force of about 447,000 men, ready for the very beginning of hostile operations; and behind this were a first reserve of 188,000, and a second reserve of about 225,000, to say nothing of the *Landwehr*, or home militia. From the active force of 447,000, three armies were formed: the first, under Gen. von Steinmetz, took up its position (as the right wing) near Treves; the second, under Prince Frederick Charles, occupied the Rhenish Palatinate; the third, under the crown prince of Prussia, assembled on the frontier of Baden, from Mannheim to Rastadt. While the German forces had assembled in these positions, the French army of the Rhine had, after the delays we have explained, arranged itself as follows: The 1st corps, under Marshal MacMahon, was posted near Strasburg; the 5th corps (Gen. Faily) further to the northward, along the frontier of the Palatinate, near Bitsch; in the centre, the 8d corps, under Bazaine, assembled near Metz; the 2d corps (Gen. Frossard) was pushed forward toward the Prussian frontier near St. Avold; the 4th corps (Gen. Ladmirault) was near Thionville, on the left wing; reserves, under Bourbaki and Canrobert, were respectively at Nancy and at the camp

of Châlons; the 7th corps, under Gen. Félix Douay, occupied the fortress of Belfort. In these positions the opposing armies stood ready for action in the last days of the month of July. A few skirmishes, of trifling importance, had taken place; but no decisive movement had been made on either side. On the 28th Napoleon, who had from the beginning announced his intention to lead the army, left Paris with the prince imperial, and proceeded to Metz to take the actual command, having on the 23d appointed the empress regent of France during his absence. On the day of his arrival at Metz he issued a proclamation to the troops. On July 31 King William left Berlin for the field, accompanied by his chief political and military advisers, Bismarck and Moltke; he also issued proclamations of encouragement, one to the people of Germany, the other to the army. On Aug. 2 he established his headquarters temporarily at Mentz. On the same day active hostilities began with the attack by three French divisions of Frossard's corps upon the garrison of Saarbrück, about 1,800 men, who were speedily driven back; they retreated across the Saar to St. Johann, while the French occupied the heights before the first named town. But the results of the engagement were unimportant, nor did the French use even the slight advantage they had gained. Immediately afterward the three German armies began an advance, in which (as the general line of direction pursued tended toward the line of the Moselle and the French centre) the third army took the initiative, inasmuch as it, being the most southerly in position, had the most ground to traverse in executing the contemplated movement. Beginning the march on Aug. 4 from their position east of Landau, the forces of the crown prince pressed forward unmolested as far as the neighborhood of Weissenburg. Here their advance guard was attacked by the French under Gen. Abel Douay, and the first serious conflict of the war began; ending, after five hours of fighting, with the retreat of the French, who lost their general, while the Germans occupied their abandoned position. On the 5th they continued the advance to Sulz. MacMahon, meanwhile, with the main body of his command, of which Douay's division had been but an advance guard, took up his position at Wörth, and prepared for battle. On the morning of the 6th the greater part of the crown prince's forces had so far pushed forward that the armies stood opposing one another, and the German advance guard met the French left wing near Görsdorf, somewhat northwest of the position of the centre. The engagement that ensued there became gradually general, and spread along the whole line of the opposing armies. Wörth, Elsasshausen, and Froschweiler, the main points of MacMahon's position, were carried after desperate resistance, and the defeat of the French terminated, shortly after four in the afternoon, in a retreat, and finally almost in a panic, the

scattered forces fleeing through the passes of the Vosges, pursued by the German cavalry. The crown prince at once continued his march toward a junction with the other branches of the German army. While these events had happened in the march of the crown prince's forces, the armies of Steinmetz (first army) and Prince Frederick Charles (second army) had effected their junction, advanced across the Saar, occupied Saarbrück, and, on Aug. 6, in the neighborhood of Saarbrück and Forbach, after a most bloody conflict for the possession of the French position on the heights of Spichern, had won another complete victory, driving Frossard both from his first line of battle and from the position he afterward endeavored to take up near St. Avold. The remnants of his corps retreated toward Metz, where Bazaine's corps was also joined by Ladmirault's from Thionville, and by troops under Bourbaki and Canrobert. The three German armies were now not long in effecting their junction upon French territory. The first and second carried on their gradual advance; while the third passed through the Vosges, taking Lützelstein and Lichtenberg after short resistance, and leaving Bitsch and Pfalzburg surrounded by detachments of troops. By the 11th the three armies were together, forming an almost unbroken line. The headquarters were established in Saarbrück. By the 14th the first German army had advanced to the immediate neighborhood of Metz; and there, in the afternoon of that day, by a successful attack upon the 8d French corps, which had been sent out to cover the withdrawal of troops from the fortress, baffled the first attempt of the French to retreat to the line of the Marne. The engagement, which took place near Courcelles, and gradually assumed larger proportions, ended with the retreat of the French troops into the fortifications, and secured to the forces of Prince Frederick Charles the necessary time to take up a position for cutting off the French army concentrated at Metz, which Napoleon now left under the chief command of Bazaine, from junction with other French forces. On the evening of the 15th the 8d corps of Prince Frederick Charles's command took up their march toward the river, crossed it, and pressed northward as far as the villages of Gorze and Orville. The next morning the march was continued as far as the neighborhood of Mars-la-Tour and Vionville. Here began, about 10 A. M. on the 16th, the engagement which proved to be the most bloody and sharply contested struggle of the war thus far. Beginning by an attack by the Germans upon the much superior force of the enemy which had been encamped at this point, and sustained for hours by the 8d corps alone until the 10th corps and Prince Frederick Charles advanced to its aid in the afternoon, the battle ended in the defeat of the French, though with an immense loss of men to the German army. Bazaine now withdrew his troops to a con-

siderable distance, took up a position between Gravelotte and St. Privat-la-Montagne, and there massed almost his whole force, preparatory to a final and decisive engagement. For this the Germans also made ready, and on the 18th the hotly contested battle of Gravelotte began, ending in a renewed defeat of the French, and in their retreat within the fortifications of Metz. The results of this engagement were most important. By it nearly one half of all the French troops in the field were effectually shut up within a surrounded fortress; while the Germans, leaving the greater part of the first and second armies as a besieging force before the city, were free to execute the movement which was now at once begun—the advance against the army of MacMahon, which was reorganizing at Châlons, reinforced by Faily's corps, a part of Félix Douay's, and numerous reserves. For the purpose of this and of further movements, the organization of the German forces was now somewhat changed. A fourth army was formed, under command of the crown prince of Saxony, from portions of the other armies, and from the troops who had up to this time been engaged in guarding the German coasts against a naval attack, which was hardly to be any longer feared. Less important changes were also made in the organization of the first and second armies, and the forces of the third were considerably increased. The advance of the last named body and of the army of the crown prince of Saxony was begun on the 19th, the very day after the battle of Gravelotte; the king of Prussia assuming the command of the united force, which was now to enter upon operations which continued to the gates of Paris. The army under the crown prince of Saxony (army of the Meuse, as it came to be called) advanced along the highway toward Châlons. The third army at the same time crossed the Meuse and advanced toward Bar-le-Duc. Toul had been previously attacked, and a besieging force was now left to invest it, while the remainder of the army continued its progress. In its gradual advance it was met by the news that MacMahon had withdrawn from Châlons, and had taken up his march to Rheims, and beyond it in the direction of Reims, evidently with the intention of relieving Bazaine's army. In consequence of this intelligence the German march was immediately turned northward, in order to intercept the French army and occupy a position between it and Bazaine. The opposing armies rapidly approached each other, as the French pressed forward from the neighborhood of Vouziers along the Meuse; and after several minor engagements between detached parties, on Aug. 30 a large body of the Germans surprised the corps of Gen. Faily in their camp near Beaumont, drove them from it, and after both sides had been reinforced began a battle which resulted in the retreat of the French beyond the Meuse and their further withdrawal toward

Sedan. Here MacMahon massed his army and prepared for a more important conflict. The emperor Napoleon was now with this portion of his forces. After the first defeats he had relinquished the command of the armies to his marshals (Aug. 8), and the management of affairs in the capital to a new ministry (Palkao's) under the empress regent; and leaving Metz immediately after the battle of Courcelles, he had gone to MacMahon at Châlons. The prince imperial had been sent to Belgium when the situation had first become critical. The opposing forces were now prepared for an inevitable and decisive engagement. The battle of Sedan was begun by the Germans Sept. 1. The troops of the army of the Meuse and the third army, by a series of manœuvres and after severe fighting, drove the French from all sides to that fortress, where, almost surrounded, entirely defeated, and without provisions or defences sufficient to endure a siege even of a day, they were compelled to capitulate. The emperor surrendered himself to King William in person, Sept. 2, and was carried a prisoner to Wilhelmshöhe. In dead, wounded, and the vast number of prisoners of war, the French had thus lost in a few days an army of nearly 150,000 men. The news of Sedan created intense excitement at Paris. In the night of Sept. 3-4 Jules Favre demanded in the corps législatif the deposition of the emperor and his dynasty; the popular indignation against Napoleon and his party was without bounds. On the 4th the people filled the streets and thronged to the hall of the corps législatif and thence to the hôtel de ville. Here Gambetta, in the midst of the most tumultuous applause, proclaimed the republic; and a provisional government of national defence was at once formed. This was under the presidency of Gen. Trochu and the vice-presidency of Favre, and included Emmanuel Arago, Crémieux, Ferry, Gambetta, Garnier-Pagès, Glais-Bizoin, Pelletan, Picard, Rochefort, and Simon. In the evening a decree of the new government declared the corps législatif dissolved and the senate abolished. Jules Favre was placed in charge of foreign affairs. The empress fled from Paris and took refuge in England. The government of national defence issued an address to the army; and a circular was sent to the European powers explaining the attitude of France. The most energetic measures were begun for putting Paris in a position for defence. Later in the month Favre had an interview with Bismarck at Ferrières, in which he unsuccessfully sought to negotiate terms of peace. A similar purpose was the cause of a visit of Thiers to the principal European courts. The elections for a national assembly, to immediately regulate affairs, which were decreed during the month by the government of national defence, were postponed from time to time on account of the difficulty of communicating with the country at large. After the battle of Sedan there

was but little to impede the advance of the German army to the capital. On the 5th they entered Rheims, and only minor skirmishes and trifling engagements attended their further march, until on the 15th they had closely approached Paris, advancing in the general form of a half circle. A sortie by Gen. Ducrot on the 19th was repulsed, and a few days later the actual investment of the city was begun, with the army of the Meuse on the northern and northeastern sides, the third army on the southern and southeastern, and bodies of cavalry guarding the approaches to the western front. The German headquarters were established at Versailles. A portion of the French government of national defence remained in the capital; a portion, in order to be in communication with the provinces, was established at Tours; among the latter was Gambetta, who exercised the functions of minister of war at the same time that he led in the government of the interior, thus combining in his hands most of the executive power of the governing body. The siege of the capital, which now began, will be found described in the article PARIS. Almost simultaneous with its beginning was the fall of Strasbourg, which capitulated in the night of Sept. 27-28. Toul had surrendered on the 28d. Soissons and Schlettstadt, among the chief places besides Metz which still resisted, capitulated respectively on Oct. 16 and 24, and on the 27th Metz itself also yielded, Bazaine surrendering 173,000 men. (See METZ.) The chief attention was now concentrated upon Paris. All the attempted sorties of the besieged proved useless, while great discontent and suffering prevailed within the city. The members of the government in the capital had the greatest difficulty in repressing popular tumults and disorder. The military situation in the rest of France was of such a character as to give little hope of rescue by those French troops still in the field. After the fall of Metz, Prince Frederick Charles had marched the greater part of his command southward, to engage the enemy's "army of the Loire," now increased, in part by the addition of small bodies from the defeated troops of other corps, to about 150,000 men. This army, under Gen. Aurelle de Paladines, had at first won some successes, defeating Gen. von der Tann, the German commander who held Orleans, and retaking that city (Nov. 8, 9, 10). The latter, retreating, massed his troops on the Eure; but Aurelle de Paladines did not follow up his advantage, and the Germans soon took the offensive. Several minor engagements occurred, and now Aurelle attempted to march almost his entire force toward Paris; but meeting and attacking the 10th division of Frederick Charles's army, he was defeated near Beaune-la-Rolande (Nov. 28) and forced to withdraw again to Orleans, near which city he took up a position for battle. A series of battles followed, ending with a decisive defeat of the French on Dec. 4, the

Germans capturing the town and many prisoners, while the remainder of Aurelle's troops retreated in confusion. (See ORLEANS.) From the remains of this defeated force were now organized two new armies, under Bourbaki and Chanzy. The Germans made a corresponding division, Frederick Charles leading a part of his command against Bourbaki, who took up a position near Bourges, while the remainder, with other troops, under the command of the grand duke of Mecklenburg, advanced against Chanzy, whom they defeated at Beaugency, Dec. 8, and followed in his subsequent retreat to Blois (13th), Vendôme (16th), and thence (dividing into two detachments) toward Le Mans and Tours. On the 31st Chanzy made an attempt to recover his ground, but was again defeated in the neighborhood of Vendôme. Still continuing his efforts at advance, the forces of the enemy were now concentrated against him, and he was gradually forced back, in a long series of minor engagements (Jan. 6 to 11). Finally he was overwhelmingly defeated and his army fairly broken up and put to flight, in severe combats at Corneille, Ste. Croix, and Le Mans (Jan. 12). With these German victories the war in this portion of France may be said to have ended. In the north, the newly organized army under Gen. Faidherbe, seeking to advance to the relief of Paris from that direction, had been opposed by the Germans (a part of the first army) under Gen. Manteuffel. Massed at first chiefly at Amiens and Rouen, the French were defeated at the former place on Nov. 27, the town being occupied on the 28th; from the latter place they retreated, and it was occupied without resistance on Dec. 6. From Lille and Arras Faidherbe again tried to advance toward Paris by passing behind the Germans; but Manteuffel again checked him in an engagement at Pont Noyelles, near Amiens, Dec. 23; and when he again assumed the offensive, a few days later, defeated him once more at Bapaume, Jan. 2 and 3, 1871. Manteuffel, transferred to the south, was now succeeded by Von Goeben, who put an end to Faidherbe's fourth attempt by inflicting upon him an overwhelming defeat at St. Quentin, Jan. 19, leaving his army completely disorganized, and bringing to a conclusion all serious operations in this quarter. The few fortresses and cities that had still held out after the fall of Metz had also surrendered one by one before this time (Thionville, Nov. 24; La Fère, Nov. 27; Mézières, Jan. 2; Rocroy, Jan. 5); and only in the south did any really serious opposition to the German arms remain in the field. Here, where Gen. Cambriels had been forced back during the month of October, 1870, by the Germans under Von Werder, until he had retreated to Besançon, the aspect of affairs was somewhat different from that presented in the north. Von Werder, whose force was too small to take Besançon, had taken Dijon (Oct. 30); but Ricciotti Garibaldi, who

commanded a body of French troops, had, by successive advantages gained over outlying detachments of German troops, approached the place during November, and on the 26th he began an attack. This was only repulsed after a fierce struggle; and the French were pursued, but without important results. On Dec. 18 Von Werder again defeated the French near Nuits; but on the 27th he was compelled to abandon Dijon on account of the advance of an army under Bourbaki, who had left his position on the Loire, and was marching to the relief of the fortress of Belfort, which had been besieged by the Germans since Nov. 8. Von Werder, withdrawing from Dijon to Vesoul, and thence to Villersexel (where he had a short engagement with the enemy's left wing), finally took up a position near Héricourt, where, with his small force, he awaited the attack of Bourbaki's army of 150,000. In a three days' fight which followed (Jan. 15-17, 1871) he so completely repulsed it that the French were finally driven into full retreat. The approach of the army of Manteuffel at almost the same time compelled the French troops to abandon Dijon. The retreating army of Bourbaki (who had now been succeeded by Clinchant) did not again assume the offensive; but, slowly pressed toward the southeastward by the advancing Germans, who had several conflicts with its rear guard, it finally ended its share in the war by retreating over the Swiss frontier on Feb. 1, thus finally withdrawing from the field. In the mean time the situation of Paris had become hopeless; and on Jan. 28 arrangements for its capitulation had been concluded between Jules Favre and Bismarck by the convention of Versailles, which also provided for a general armistice of three weeks (afterward extended to March 18), during which there should be general elections for a national assembly to decide upon the question of further war or peace. By the terms of the convention, the Germans took possession of the forts, the army of Paris were declared prisoners of war (except the national guard and a division of 12,000 others), and the seat of war in the southeast (near Belfort) was expressly excepted from the armistice. The elections, after a violent discussion among the members of the government of defence as to the course to be pursued, took place on Feb. 8, and resulted in the choice to the assembly of a majority of legitimist and Orléanist members, as opposed to republicans, and in placing its control in the hands of the more conservative or prudent party as regarded the conclusion of peace. The first sitting of the new body was held in Bordeaux on the 12th, and on the following day the government of national defence formally gave up to it their powers. On the 17th Thiers was chosen chief of the executive of the republic. On the 19th he delivered an address to the assembly, urging upon it the duty of immediately making peace and endeavoring to restore

the prosperity and credit of the country; and on the same day he nominated the following ministers, who were confirmed: foreign affairs, Favre; justice, Dufaure; interior, Picard; instruction, Jules Simon; public works, De Larcy; commerce, Lambrecht; war, Leflô; marine, Admiral Pothuau. To this list Pouyet-Quertier was added as minister of finance, Feb. 24. A commission, the active members of which were Thiers, Favre, and Picard, was appointed to negotiate with the Germans. They arrived at Paris Feb. 21, together with a supervising committee of 15 members of the assembly; and on the 26th the preliminary treaty of peace was signed at Versailles. It contained the following provisions: France ceded to Germany the greater part of Alsace and Lorraine (see *ALSACE-LORRAINE*); it agreed to pay as war indemnity five milliards of francs, one milliard during 1871, the remainder within the next three years; the German troops should be gradually withdrawn from French soil as the indemnity was paid, so that the last force should leave it with the last payment; the indemnity should carry an interest of 5 per cent. till paid; the French troops should withdraw and remain beyond the Loire until the conclusion of a final treaty of peace (except garrisons for Paris and the other fortified towns); the inhabitants of Alsace and Lorraine should enjoy for a certain period (afterward fixed at six months) certain privileges in respect to trade; the negotiations for a definitive treaty of peace should begin at once at Brussels. These conditions were accepted and the preliminary treaty confirmed by the assembly March 1, by a vote of 546 to 107. In the same session the deposition of Napoleon and his dynasty was formally declared. A special stipulation, also accepted with the treaty, had provided for the entry of the German troops into a part of Paris, which, however, they were immediately to evacuate on the acceptance of the full treaty by the assembly. This triumphal entry took place on March 1 and 2. On the 8d, the news of the acceptance being received, the Germans again withdrew. The arrangements for the negotiation of final peace were now complete. On the 12th Versailles was evacuated also, and the assembly at once transferred its seat from Bordeaux to that city. But Paris had not yet ended its suffering. The withdrawal of the enemy was almost immediately followed by the uprising of the populace and the rule of the commune; and for nearly two months the unfortunate capital endured a second and even more terrible siege at the hands of the French themselves. (See *COMMUNE DE PARIS, II.*) Only at the end of May was order restored, and the whole country in a condition of actual peace. The definitive treaty with Germany, the conditions of which were substantially the same as those agreed on at Versailles, had been signed at Frankfurt on the 10th of May.—The first measures taken by the assembly

after the conclusion of the war (besides the negotiation of a most successful loan of 2,500,000,000 francs) tended naturally toward the more permanent constitution of the government. The only matter bearing upon this hitherto decided had been the law providing for more liberal measures in the communal and municipal governments and elections, which was passed by the assembly on April 14. The legitimist and Orleanist parties in the assembly at once became conspicuous in the discussion. On June 8 the proscription of the Bourbon and Orleans princes, which had been in force respectively since 1830 and 1848, was revoked; and on Dec. 19, after a stipulated delay for confirmation, the latter took the seats in the assembly to which they had been elected. The count de Chambord, the Bourbon claimant of the throne, though he at first returned to France, soon after issued a proclamation declaring that he could resign none of his claims, and would not abandon the white flag of the Bourbons; and this done, he returned to his residence at Frohsdorf. It soon became evident that for the time being, at least, no other form of government than the republic could be adopted. The elections held July 2 to fill vacancies in the assembly resulted in the great majority of cases in the choice of republican members; and the tendency of even conservative opinion was also in this direction. On Aug. 12 the members of the left centre introduced into the assembly a bill prolonging the presidency of Thiers for three years, conferring upon him the official title of "president of the French republic," and providing for the appointment by him of a ministry responsible, like himself, to the assembly. The bill also secured to the assembly the constituent power, thus enabling it to undertake subsequently the discussions of plans for the permanent constitution of France. After a violent debate, this proposition passed on the 81st. On Oct. 12 a supplementary treaty with Germany was signed at Berlin, providing for some details, and making some few changes in regard to the ceded territory. At the beginning of 1872 the discussions as to a permanent form of government were renewed. Supplementary elections held on Jan. 7 resulted in the choice of four radicals, nine moderate republicans, and four conservatives. The conservatives now held the ascendancy in the assembly, and the advocates of a monarchical government for a time seemed likely to develop sufficient strength to carry through their plans. Toward the end of January the count de Chambord published another manifesto, in which he again asserted his right to the throne. But neither party was strong enough to insist upon any decided measures; and the only really effective legislative action was that referring to the material affairs of France. In January a tariff bill was submitted to the assembly by Pouyer-Quertier, imposing many new duties and taxes on raw materials, which provoked great opposition both through-

out the country and in the legislature. President Thiers vigorously supported the bill; and when, on Jan. 19, the assembly rejected it, he sent in his resignation (Jan. 20). This the assembly almost unanimously begged him to retract; and he finally consented to continue in office, as did also the ministers, who had resigned with him. On Feb. 2 the assembly passed a bill authorizing the government to inform England and Belgium of the termination of the commercial treaties existing with those nations. On March 7 the payment of two milliards of the war indemnity was formally completed at Strasburg; and, in accordance with the terms of the treaty, the German troops at once evacuated a large portion of the occupied territory. After a long debate, the army bill proposed by the government, providing for the enforcement of compulsory service, fixing the term of service at five years, and making other provisions, was adopted on June 22. On Aug. 20 the sessions of the general councils of the French departments began; and their proceedings, though of course principally devoted to the discussion of departmental affairs, gave incidentally additional evidences of the strength of republican sentiment and the improbability of success for the monarchists. This evidence was strongly confirmed by the results of the supplementary elections held on Oct. 21. The assembly nevertheless, on reconvening after a recess from Aug. 4 to Nov. 11, showed a strongly conservative tendency, and monarchical projects again became conspicuous in political discussions, but without result. A fusion of the right and right centre added to the conservative strength. On Nov. 18 an exciting debate took place as to whether the government had sufficiently endeavored to suppress the radical movements in the provinces, especially the demonstrations excited by Gambetta. Thiers defended his action and demanded a vote of confidence; but the unsatisfactory manner in which this was carried gave rise to a new disagreement between the president and assembly. This was greatly increased by the report (Nov. 26) of a committee appointed to draft an address in reply to the president's message, in which that document was sharply criticised. Thiers again threatened resignation, but the matter was compromised by the adoption (Nov. 29) of a proposition for the appointment of a committee of 80, who should prepare a bill strictly defining the relations of the executive and the legislature to one another, and otherwise regulating the responsibility of different branches of the government. This committee was chosen on Dec. 5. On the 10th a manifesto was published by members of the left (including Gambetta, Crémieux, and other leaders), demanding the dissolution of the national assembly, as the means of diverting the evils threatened by the conflicts of party in the existing body, and the election of a new legislature. Petitions to the same effect, received from the departments, were rejected by the assembly

on the 14th. On the 19th the assembly rejected a motion for the abolition of duties on raw material. The beginning of 1873 put an end to many of the plans of the Bonapartist party, which had been the weakest of the contending factions in the assembly and the country; for on Jan. 9 the ex-emperor Napoleon died at Chiselhurst, England. Immediately after, there began at Versailles the prolonged discussion and negotiation excited by the report of the committee of 80 on the president's powers and the powers of the assembly. Beginning with the proposition to permit the president only to address the assembly on certain specified occasions, and otherwise restricting his privileges, the constitutional project of the committee was several times modified on account of Thiers's disagreement with it. During the long debates concerning it Thiers several times made threats of tendering his resignation. On March 13 the committee's report was finally adopted by the assembly in a modified form. On the 15th a new agreement with the Germans regarding the remainder of the indemnity was signed, providing for the payment of the whole during the year 1873, and the withdrawal of the German troops during the same period. A bill for the exile of the Bonaparte family was passed March 29. On April 27 supplementary elections were again held, resulting in the choice of several prominent radicals. During the month of May President Thiers made a number of changes in the ministry, which, as they were not accepted as sufficiently conservative by the members of the right, placed him again in sharp opposition to that portion of the assembly, and precipitated the decisive conflict which had so long been threatening between the executive and the majority of the legislature. Thiers himself brought about the crisis by urging in an address to the assembly on May 24 the definitive establishment of the republic. This definition of his policy and that of the new ministry had indeed been forced upon him by an interpellation presented by the right, with the evident intention of compelling a vote upon his explanation, which should be decisive in regard to the continuance of himself and the ministry in power. Accordingly, no sooner had the president ended his address than the right presented an order of the day refusing to consider the form of government as under discussion, and regretting that the new ministry did not afford sufficient guarantees of a conservative policy. This, which was equivalent to a vote of want of confidence, was passed by the close vote of 360 to 344. Thiers and the ministry at once sent in their resignations, which were accepted; and Marshal MacMahon was in the same sitting chosen president of the republic. The important events of MacMahon's administration have thus far been comparatively few. For a time after his election, and especially during the summer, there seemed a probability that the efforts of the legitimists to restore a monarchy

under the count de Chambord (in whose favor the Orleanist branch of the Bourbons had agreed to yield their claim) might be successful. Many monarchists were appointed to office; the party daily gained in apparent influence; the celebration of the anniversary of the declaration of the republic on Sept. 4 was forbidden; and the hopes of the legitimists appeared to be on the point of fulfilment, when they were suddenly brought to an end by the letter of the count de Chambord to M. de Chesnelong on Oct. 30, in which he distinctly refused to make the concessions that were necessary to the acceptance by the assembly of a monarchy under his rule, and declared his determined adherence to the white flag of the Bourbons. After the recess of the assembly from July 27 to Nov. 5, the opening message of President MacMahon called for action to secure some degree of permanence and stability to the government. The right demanded that the executive power be conferred on MacMahon for a term of ten years. By a compromise this was lessened; and in the night of the 19th-20th a law was passed making his term seven years. One of the most important events subsequent to this was the conclusion of the long trial of Marshal Bazaine, by a court martial of which the duke d'Aumale was president, on a charge of treason in surrendering his army and the fortress of Metz without sufficient cause. On Dec. 10 he was found guilty and sentenced to death; which sentence was commuted by President MacMahon to 20 years' seclusion, after degradation from his rank. The payment of the last instalment of the war indemnity had taken place on Sept. 5, and by the 16th France was free from foreign occupation. During the period since the war her material prosperity has been restored with remarkable rapidity; new commercial treaties with Great Britain and Belgium were approved in July, 1873; and French industries and trade have again reached an entirely normal condition. But the political situation continued to be unsettled in the early part of 1874, owing to the systematic agitation of monarchists against the republican institutions of the country, to which new elections in various departments have given repeated sanction. On March 16, the 18th birthday of the prince imperial, the Bonapartists celebrated his majority at Chislehurst, hailing him as Napoleon IV.; to which he replied in a set speech, appealing to the decision of a new *plébiscite*. Foreign relations also continued complicated; the German empire proposed increased armaments, avowedly from fear of French retaliation, and emphatically evinced its determination to wield a paramount influence in Italian and eastern affairs. The cabinet of the duke de Broglie resigned May 16, in consequence of the defeat of the electoral bill, and was succeeded on the 22d by one under Gen. de Cissey as minister of war, composed of anti-republicans, and with little prospect of stability. (See MACMAHON.)

FRANCE, Isle of. See MAURITIUS.

FRANCE, Language and Literature of. The French is the most important of the six Romanic languages produced from Latin by the influence of other tongues. The Italian, the Roumanic or Wallachian, the Provençal, Spanish, and Portuguese are its sisters. The Belgæ of Gaul probably spoke Celto-Teutonic, the Aquitani Celto-Iberic, while the Celtæ or Galli proper occupied the centre of the country, and at the same time Greek colonies held points on the Mediterranean sea. The language of Rome overwhelmed all these idioms. The Gallic, however, was yet spoken in the 8d century; Celticism was perceptible in the *lingua rustica*, or degenerate Latin, at the close of the 5th century; and the ancient vernaculars continued to exist afterward. The *rustica* extended from the Rhine to the Pyrenees in the 4th century. The corruption of the Latin was similar in all countries from the Danube to the mouth of the Tagus, and the above mentioned languages differ only in consequence of the various barbarous tongues that have acted upon them. Since the Suevi, Visigoths, Burgundians, Franks, &c., made no efforts to destroy the languages of the inhabitants of Gaul, comparatively few words of theirs survived in the *lingua rustica*. Many Celtic elements had combined with the Latin even before Cæsar, and some were introduced afterward; but it is difficult to distinguish them from the Latin stock on account of their common origin from the storehouse of the Indo-European family of languages. The Latin jargon, tainted by Germanic ingredients, is called *lingua Romana*, and also *Gallica* or *Gallicana*. It coexisted for some time with the *Frenkiska* (*Francisca*, *Francia*), or *Theotisca* or *Tudesque*; and although it continued to exist with more vigor than the last named, it was eventually called *lingua Franco-Gallica*, or rather *Franco-Romana*, *langue françoise*. While the Frankish prevailed in the north and east of the country, the *rustica* or *Romana* was spoken south of the Loire, although also used in the Frankish regions. The council of Tours (813) recommended the use of both the rustic and Tudesco versions of the homilies. The Latin grammatical suffixes were gradually dropped, and the accusative case was in general taken as the new word. Auxiliary verbs were successively introduced from the Teutonic idioms, the case endings were supplied by prepositions, the personal endings of verbs by pronouns, or both by the fragments of ancient endings and by pronouns before the verb. In the 10th century the Latin *ille*, *iste* were converted into the article *le* and the pronouns *il* and *cet* (*ce*), the latter being pronounced *st*. According to Raynouard's hypothesis, the *lingua Romana* was separated into two dialects. The Visigoths and Burgundians S. of the Loire said *oc* (Latin *ac*, German *auch*, also) for *yes*, for which the Franks and Normans (who established themselves in France in 912) along the Seine used

oil; hence the southern or Provençal dialect was named *la langue d'oc*, and the northern (Roman-Wallonia) *la langue d'oïl*. After 879 the focus of the former was at the court of the kings of Arles, and in 927 the chief point of the latter was at the court of the duke of Normandy. Less troubled by wars and more thoroughly Romanized, the south produced distinguished *troubadours* during two centuries, while the north had, somewhat later, its *trouvères*, both named from *trouver*, to find: finders of songs, poets. From the beginning of the crusades to the death of St. Louis (1095-1270) the two dialects approached toward a fusion. The vulgar language was employed in the crusades in rousing the populace, whose war cry was, *Dieu et volt* (God wills it). A few fragments of the Bible date before 1100; but popular heroic and religious songs appear to have been composed and recited by the *jongleurs* (*joculatores*). The development of chivalric poetry in Provence was checked by the persecution of the Albigenses; the language of the troubadours was proscribed, and, together with the political rule of the north, the idiom of Picardy (a branch of the *langue d'oïl*) extended toward the south. The real French language began to be developed about the time of the conquest of Constantinople by the French crusaders, at the beginning of the 13th century. Already before the conquest of England by William (1066) English youths were sent to be educated in France; but the conquest made the Norman-French the official and court language in England. Froissart's "Chronicles" (14th century) is the first work in genuine French. Francis I. substituted the language for Latin in public transactions. Rabelais greatly enriched it; Ronsard and Du Bellay, Amyot and Montaigne, and others, developed it further. The religious reform, political troubles, the influence of the Italian wars and queens, modified it greatly. The introduction of Arabic words is chiefly due to the crusades, and that of Greek and Latin words and of scientific terms to the study of those languages and to the cultivation of the natural sciences. The *académie française*, established by Richelieu for the regulation of the national language (1635), the influence of the court, the labors of the Port-Royalists, especially Pascal (1656), and a galaxy of great writers, purified, augmented, and diffused it more and more. It was first used as a diplomatic language at the conferences of Nimeguen (1678).—The French is certainly a very clear tongue, on account of the strictly logical order of its syntax, but very monotonous, and incapable of the composition of words already fixed, as well as of bold poetic turns. The French language, in short, is, like every other, the exponent of the nationality, vicissitudes, intelligence, culture, and taste of the people that speak it. It is written with the same letters as the English. K and W occur only in Breton, Norman, and Flemish names incorporated into French, and in other foreign words.

There are 12 distinct vowels as regards their quantity; they are represented by six letters called vowels, or by their combination, and by the help of *m, n*, viz.: *a, e, é, i, o, u, ou, eu*, and four nasals, *an, in, on, un*. Including all modifications (*â, ê, î, ô, û*, and the so-called *e muet*), they stand for 20 sounds, of which Malvin-Cazal and Michelet of the *conservatoire de musique* count 17. Of consonants there are 20, represented by 18 letters, viz.: *b, k* (also written *c* and *ch* as in *chœur, q, qu*, and *g* as in *sang et eaux*), *d, f* (and *ph*), *g* hard (also *gh, gu*), the sound of English *si* and *zi* in *cision, crozier* (written *g* before *e, i*, and *y*, and *j* before all vowels except *i* and *y*), *h* (unless mute), *l, l mouillé* as in the English *million* (written *ill, il, or lh*, and now generally dropping the sound of *l*, as *mou-yé*), *m, n, n mouillé* as in the English *onion* (written *gn, nh*), *p, r, s* (also *c* before *e, i, y*; also *x* in *Bruxelles, t* in *nation*), *t* (also final *d* when pronounced with the next word, as *grand homme*), *v* (also final *j'* when pronounced with the next word, as *neuf aunes*), *y* as in the English *yes*, with the preceding power of *i* (for instance, *payer*, pronounced *pè-yé*), *s* (written also *z*, when pronounced with the next word, as *les eaux, aux esprits*), and the sound of the English *sh*, as in *shall* (written *ch*). Most consonants are not uttered when final, unless they are joined to a succeeding word which begins with a vowel or *h* mute. *S, x, z, t*, being the principal grammatic letters, are most frequently joined in this manner. On French pronunciation Malvin-Cazal, Mme. Sophie Dupuis, and Bescherelle (*Plus de grammaires*) may be advantageously consulted.—The dialects and *patois* of the French language are: I. The academic, consecrated by the best literature. II. Old French: 1, Walloon (*rouchi*), in Belgium and West Luxemburg; 2, Franco-Flemish; 3, Picard and the dialect of Artois. All these are Franco-Romanic. III. New French. A. In the north: 1, Norman; 2, patois of Paris and Champagne; 3, of Lorraine and the Vosges; 4, the Bourguignon; 5, patois of Orleans and Blois; 6, of Anjou and Maine. B. In the middle and west: 1, Auvergnat; 2, Poitevin; 3, Vendéen; 4, Bas Breton; 5, Berrichon; 6, Bordelais and Gascon. C. In the east: 1, Franc-Comtois and its varieties in Valais and Neufchâtel, and partly in the cantons of Fribourg and Bern; 2, Vaudois (Roman, Romain); 3, Savoisien and Gênois; 4, Lyonnais; 5, patois of the cities of Dauphiny. D. In the islands of Jersey and Guernsey, Anglo-Norman. French is also spoken with various local peculiarities or corruptions in Algeria, on the Senegal, in the Mascarene and Seychelles islands, French Guiana, the French West Indies, the greater part of Hayti, in Illinois, Michigan, Louisiana, and some other of the United States, by the *habitans* of Lower Canada and even some aboriginal tribes, and in some settlements in Asia and Oceanica. There are also small French colonies in the banat of Temesvár and

elsewhere. It is the most generally known of all languages among civilized nations, and many illustrious foreigners, as Leibnitz, Humboldt, Gibbon, and Sir William Jones, have written some of their works in it. The dialects of the *langue d'oc*, particularly the Limousin, Languedocien, and Provençal, are spoken S. of a line passing through the departments of Charente, Charente-Inférieure, Haute-Vienne, Creuse, Allier, Puy-de-Dôme, Haute-Loire, Ardèche, Drôme, and Isère. Celtic (*Breizad*) is spoken by about 1,000,000 people in Finistère, Côte-du-Nord, and Morbihan; Basque by about 150,000 in Basses-Pyrénées; Flemish in parts of Le Nord and Pas-de-Calais; Catalan in Pyrénées-Orientales; and Italian in Corsica. —Among the authors of grammars of the French tongue are: J. Sylvius (1537); Robert and Henry Stephens (Paris, 1558 and 1579); Ramus, *Grammaire française* (1571); Vaugelas, *Remarques sur la langue française* (1647); the Port-Royal writers, Lancelot and Arnauld, *Grammaire générale et raisonnée* (1680, often republished); Wailly, *Grammaire française* (1754); Beauzée, *Grammaire générale* (Paris, 1767); Levisac, "Theoretical and Practical Grammar of the French Tongue" (1801); Fabre, *Syntaxe française* (1803); Guérault, *Grammaire française* (1806); Lhomond, *Éléments de la grammaire française* (last ed., 1865); Girault-Duvivier, *Grammaire des grammaires* (1811, many times reprinted); Landais, *Grammaire générale et raisonnée*, a compilation from numerous sources (1836); Noël and Chapsal, *Nouvelle grammaire française* (1823, many times republished). Still later are the grammars of Letellier, Poitevin, and Larousse. Among the best dictionaries are those by Robert Stephens (French and Latin, 1543); Aimar de Rançonnet (1606); Richelet (1680); Furetière (1690); Menage (1694); the famous dictionary of Trévoux, so named from its place of publication (1704); those of Boiste and Bastien (1800), Roquefort, Raymond, Laveaux, and Landais; several works by Charles Nodier; and Bescherelle, *Dictionnaire national, ou Grand dictionnaire critique de la langue française* (2 vols. 4to, 1843-'6). The *Dictionnaire de l'académie française* was published in 2 vols. fol. in 1694, and has been several times reprinted. A *Dictionnaire historique de la langue française*, on a grand scale, is in preparation by the academy. The latest and best dictionary is that of E. Littré in 4 vols. 4to (Paris, 1863-'78). Girard (1736), Beauzée (1769), Roubaud (1785), and Guizot (1809-'22) have written on French synonyms; and Gérusez (1801), Henry (1811), Villemain, in the dictionary of the academy, J. J. Ampère (1841), F. Wey (1845), and F. Génin (1845-'6), on the history of the French language. —LITERATURE. The earliest literature of France is that of the *trouvères* and *troubadours*. The latter, who wrote in the soft southern *langue d'oc*, produced short lyrical effusions on love or matters of trifling

import; they flourished most during the 11th and 12th centuries. The *trouvères*, on the other hand, in their narrative poems, known as *chansons de geste*, and written in the energetic *langue d'oïl*, treated of great national subjects and celebrated the heroic deeds of illustrious kings and knights. Some of their compositions, the earliest especially, have a striking character of grandeur, which may sometimes be not unfavorably compared with that of the ancient epic poems. These *chansons de geste*, which are also called *romans*, are very numerous, and have been classified into three cycles, bearing respectively the names of Charlemagne, King Arthur, and Alexander. The first cycle of course includes all the poems that celebrate the deeds of the great Frankish emperor, his descendants and vassals; one of the oldest and perhaps the most magnificent of this category is entitled *La chanson de Roland ou de Roncevaux*. The Armorican cycle or that of King Arthur is filled with the traditionary legends connected with old Britain and the achievements of the Norman warriors; the *Roman de Brut*, or that of King Arthur of Britain, on one side, and the *Roman de Rou*, or that of the dukes of Normandy, on the other, may be said to be the double foundation on which all the poems belonging to this series rest. The cycle of Alexander consists of poems in which recollections of Greece and Rome are strangely mixed with chivalric notions and legends of fairy land. The "History of the Taking of Troy," composed about 1160 by Benoît de St. Maure, and the "Romance of Alexander," about 1180, by Lambert li Cors and Alexandre of Paris, are fair specimens of these compositions. They were succeeded by satirical and allegorical poems of equally vast proportions, some of which enjoyed unparalleled popularity, such as the *Roman du renard* and the *Roman de la rose*, from which Chaucer afterward adapted and partly translated his "Romaunt of the Rose." The *fabliaux* and several lighter kinds of poetry cultivated by the *troubadours* were also treated by the *trouvères*, who found here an appropriate field for their ingenuity and ready wit. Among those who excelled in the *fabliaux* was Rutebeuf, who lived in the reign of St. Louis. Songs were not neglected, and those of Abélard in the 12th century enjoyed a wide popularity. Audefroy le Bastard, Quesnes of Bethune, and the castellan of Coucy were among his most distinguished successors. Thibaud, count of Champagne and king of Navarre, deserves to be particularly mentioned; the songs in which he alludes to his love for Queen Blanche of Castile, the mother of King Louis IX. of France, have given him historical celebrity. The progress of prose was slower than that of poetry, but the 18th century presents two specimens showing that it had already acquired a certain degree of power and polish; these are the "Chronicle of the Conquest of Constantinople," by Villehardouin

(1207), remarkable for its soldier-like simplicity and straightforwardness, and the *Mémoires* in which Joinville tells of the heroic deeds and private virtues of the good king Louis IX. The whole literature of the 14th century culminates in Froissart's "Chronicles," which remain the model of this kind of writing, and present the liveliest pictures of society and manners during that period of war and gallant emprise. Christine de Pisan and Alain Chartier deserve notice for their intelligent efforts toward the improvement of prose. This improvement is fully illustrated in the 15th century by the *Mémoires* of Comines, which present a striking delineation of the characters of Louis XI. and his contemporaries. Already a popular poet, Villon, had given evidence in his poems that French verse was able to reach a high sphere of excellence; and Duke Charles of Orleans that it had lost nothing of its gracefulness. The revival of classical learning and the religious reformation exercised a powerful influence on French literature in the 16th century. Its principal characteristics being freedom of thought and variety of style, writers cannot be judged according to a single standard. In originality Rabelais and Montaigne are entitled to the first rank. The former, whom Lord Bacon styled "the great jester of France," was a profound scholar, physician, and philosopher, and contented himself with the renown of a profane humorist. His nondescript romance, the "History of Gargantua and Pantagruel," is filled with strange tales, wild notions, amusing quibbles, and gross buffooneries, interspersed with a seasoning of good sense, sound philosophy, and railery. A writer of more refinement and keener wit was Montaigne, whose "Essays," one of the standards of French literature, are a series of free and familiar disquisitions upon every subject, couched in the most easy and winning style, but skeptical and cynical throughout. His views were partly reduced to a system by his friend and disciple Charron, in his treatises *De la sagesse* and *Des trois vérités*. Meanwhile the reformation had been vindicated by Calvin in his *Institution de la religion chrétienne*, a masterly piece of writing, which afforded convincing evidence that French prose had now acquired strength and gravity enough to become a fit vehicle of religious eloquence; and, later in the century, an admirable pamphlet, the *Satire Ménippée*, and some speeches of the chancellor L'Hôpital, proved it to be flexible enough for political purposes. Its capacity for lighter subjects had been previously demonstrated by the tales of Margaret of Navarre. Amyot invested it with new graces by happily blending Grecian and French beauties in his translation of Plutarch's "Lives." In poetry this period was less successful. Clément Marot (1495-1544) had indeed exhibited elegance, grace, and wit, in his epistles, epigrams, and elegies; but he had merely given

perfection to inferior branches of poetry. Ronsard attempted a higher flight; he tried to invest French verse with that power, variety, and inspiration which he so much admired in Greek metres; but his violent introduction of foreign forms and elements into the vernacular was far from attaining the fortunate results he anticipated; in spite of all his defects, however, he contributed to elevate the tone of French poetry. In the 17th century, Malherbe appeared as the reformer, or rather the regulator, of poetry; a man of fastidious taste and meagre imagination, he ridiculed the artistic luxuriance of Ronsard, and introduced a style of grammatical correctness and dry elegance which sometimes reached pomposity, but was destructive of feeling and enthusiasm. His polishing process was nevertheless of great service to poetical language; and his odes, stanzas, and other pieces present many beautiful lines, which are frequently quoted. Mathurin Regnier (1573-1618) was the earliest of the French satiric poets, and his verses are full of vigor. Balzac devoted his attention to the improvement of prose; and his semi-philosophical works, his epistles especially, were valuable at the time as models of careful and harmonious rhetoric. Such were also, notwithstanding their mannerism, the frivolous but witty letters of his friend Voiture. Both were great favorites at the hôtel Rambouillet, the headquarters of a society of wits and fashionable ladies, who acted as arbiters of good taste and elegance. Many social reunions were now in reality literary clubs, which gave particular attention to philological propriety; one of these, receiving from Cardinal Richelieu the title of the French academy, was especially appointed "to establish certain rules for the French language, and make it not only elegant but capable of treating all matters of art and science." Leaving mere disquisitions about words to such societies, three great men now enriched French literature with works in which style was only a medium for conveying original conceptions or powerful thoughts. Pierre Corneille brought tragedy to a degree of grandeur which has not been surpassed on the French stage; *Le Cid*, *Horace*, *Cinna*, and *Polyeucte* are still the objects of admiration; while *Pompée*, *Rodogune*, *Héraclius*, *Don Sanche*, and *Nicomède*, though less perfect, abound with striking beauties. Descartes, in his *Discours sur la méthode*, showed that the French vernacular was now equal to the highest philosophical subjects; and Pascal, in his *Lettres provinciales*, in which comic pleasantry and vehement eloquence are happily blended, first framed a standard of French prose. Such was the opening of the splendid literary epoch which is generally styled the age of Louis XIV.; and following it came a galaxy of superior minds, who, under the royal patronage, applied themselves to perfecting every branch of literature. Sacred eloquence was successfully cultivated, and the pulpit was adorned by

the funeral orations of Bossuet, full of pathos and religious melancholy; of Fléchier, remarkable for artistic finish; the sermons of Bourdaloue, the powerful dialectician, of Massillon, the most exquisite and most attractive of preachers, and of Fénelon, two of whose sermons place him in the same rank with Bossuet. Tragedy, in the hands of Racine, lost perhaps a little of the imposing character with which it had been invested by Corneille, but teemed with the most touching human feelings, clothed in a language unapproachable for correctness, elegance, and sweetness. *Andromaque*, *Iphigénie*, and *Phèdre* remind us of the productions of ancient Greece, while *Athalie* brings on the stage in a style of adequate splendor an episode of the Hebrew annals. Comedy, which had been successfully attempted by Corneille in *Le menteur*, reached its highest pitch with Molière; his masterpieces, *Le misanthrope*, *Tartufo*, *L'Avare*, and *Les femmes savantes*, are profound and humorous creations. *L'École des maris* and *L'École des femmes*, which are scarcely inferior, *Amphytrion*, a licentious but exceedingly attractive comedy, *Le festin de Pierre*, a strange mixture of the comic and dramatic elements, several farces, *Le bourgeois gentilhomme* and *Le malade imaginaire*, afford abundant evidence of Molière's flexibility of genius no less than of his power of observation. After him, but at a great distance in point of merit, Regnard, Dancourt, and Dufresny furnished the French stage with light comic sketches. Fable, through La Fontaine's genius, was but comedy on a smaller scale; this inimitable poet, whose popularity is unrivalled as it is unfailing, had presented in his collection of fables "a drama in a hundred acts," animated by truthfulness and keenness of observation, transparency of narrative, and humorous fancy. Most of these qualities are also found in his miscellaneous poems, and especially in his "Tales," whose licentiousness, however, renders them unfit for general reading. Didactic, philosophical, and satirical poetry, that is, poetry under its less poetical forms, had as its representative Boileau, who finished the work previously undertaken by Malherbe; his *Art poétique*, his *Épîtres*, his *Satires*, as well as his heroico-comic poem *Le lutrin*, are remarkable for good sense and symmetry; they abound with wise maxims and common truths finely expressed, but are entirely deficient in poetical enthusiasm. Moral philosophy was not neglected. Malebranche, the disciple of Descartes, the sagacious and imaginative author of *La recherche de la vérité*, Bossuet in his *Connaissance de Dieu et de soi-même*, Fénelon in his treatise *De l'existence de Dieu*, and Pascal in fragments which have been collected under the title of *Pensées*, considered the highest problems of humanity from a Christian point of view; while La Rochefoucauld in his *Sentences et maximes* wrote a libel upon mankind, and La Bruyère in his *Caractères* drew vivid and amusing sketches of human characters, manners, and oddities. History,

which under the pens of Saint-Réal and Vertot was but a faint imitation of the style of ancient historians, was treated with some energy by Mézeray in his *Histoire de France*, and with ingenuity by Fleury in his *Histoire de l'Église*, while Bossuet clothed it with an imposing character of eloquence in his *Discours sur l'histoire universelle*, and with the earnestness of theological discussion in his *Histoire des variations des Églises protestantes*. The personal *Mémoires* of Cardinal de Retz concerning the wars of the Fronde are among the masterpieces of familiar history. Hamilton's *Mémoires du comte de Gramont* brings us to lighter kinds of literature. The novels of Mme. de Lafayette, *Zaïde* and *La princesse de Clèves*, present a faithful though somewhat ideal picture of elegant society, into which we penetrate through the familiar letters written by Mme. de Sévigné to her daughter and friends; these letters furnish us with a complete and lively panorama of the social life of the age. Fénelon's *Télémaque*, which is written in an epic form, and can scarcely be ranked among novels, created a deep sensation at the end of the 17th century, being considered an indirect censure of Louis XIV., gained great popularity on the same account during the following reign, and deservedly keeps a high rank among French standard works; it marks the crowning point of a remarkable literary period.—We now reach the age that has been called philosophical *par excellence*. A number of free thinkers, among whom Bayle, the author of the great *Dictionnaire historique*, is the leading spirit, and certain poets, Chaulieu especially, had been paving the way for the coming philosophers. The 17th century had been on the whole a religious age; the 18th was eminently an age of skepticism and infidelity. Literature now became a means of conveying bold opinions or assailing time-honored creeds and institutions. Four men of genius, Montesquieu, Voltaire, J. J. Rousseau, and Buffon, exercised the most powerful influence over their contemporaries, while each acted a different part in the general struggle. Montesquieu, a writer of unusual scope of mind, combining a masculine vigor with great brilliancy of style, commenced his career by publishing *Les lettres persanes*, a satire on French manners, government, and even religion. He illustrated the philosophy of history in his *Considérations sur la grandeur et la décadence des Romains*, a masterpiece of historical style; and finally produced the *Esprit des lois*, a profound disquisition upon general legislation—"a book," says Vinet, "with which genius was inspired by justice and humanity." Voltaire, the true personification of his age, protean in disposition as well as in talents, was destined by his faults no less than his good qualities to become at once a leader; and the power he seized when still young, he preserved unimpaired to his last moment. He was for half a century the king of public opinion. His wonderful ver-

satirist enabled him to treat successfully almost all branches of literature; as a tragic poet he takes rank next to Corneille and Racine; his tragedies, *Méropé*, *Zaïre*, *Mahomet*, *Alzire*, &c., combine pathos with dramatic interest and liveliness of style; his *Discours sur l'homme* and other philosophical poems are to be classed with the first of their kind; while his miscellaneous effusions, as numerous as they are sprightly, raise him in this sphere above any other French poet. The perspicuity of his mind appears in his *Dictionnaire philosophique* and other philosophical works; and his wit in his novels, which, notwithstanding their licentiousness, are models of their kind. His various books on history, *Charles XII.*, *Le siècle de Louis XIV.*, *L'Essai sur les mœurs des nations*, are still read with profit and pleasure; while his bulky correspondence is scarcely excelled by that of Mme. de Sévigné. If Voltaire may be said to have been the master of minds, J. J. Rousseau was the master of souls. His passionate eloquence conquered the coldest and even the most prejudiced; eloquence indeed is the mainspring of all his works. As a writer of impassioned prose he has no superior, scarcely an equal, among the most perfect of his rivals. His first essay, *Discours contre les sciences et les arts*, which he wrote when 38 years of age, was a declaration of war against civilization; the second, *Origine de l'inégalité parmi les hommes*, was an attack upon the existing social order. In his *Émile* he drew a visionary plan of education, and in his *Contrat social* proclaimed the principles of popular sovereignty and universal suffrage. His *Nouvelle Héloïse* is a novel in which love and paradox are blended together, while his *Confessions* excite a mixed feeling of sympathy and disgust. Buffon occupied a less agitated sphere, devoting his labors to the description of nature; and his great *Histoire naturelle* is a literary masterpiece, though its scientific reputation has passed away. Diderot, a passionate and incorrect writer, and D'Alembert, a great geometer, founded the *Encyclopédie*, a vast review of human knowledge, often threatening to social order, always hostile to religion. Helvétius in his treatise *De l'esprit*, D'Holbach in his *Système de la nature*, Lamettrie in his *Homme-machine*, and Raynal in his *Histoire philosophique des deux Indes*, far exceeded the doctrines of the encyclopædists; while other writers, such as Vauvenargues, Fontenelle, whose style is yet admired for its clearness and elegance, Condillac, a most perspicuous analytic philosopher, Mably, a bold publicist, and Condorcet, who wrote afterward an *Esquisse des progrès de l'esprit humain*, mostly kept on the side of moderation. The various branches of literature connected with philosophy were the most productive; but the others were far from being neglected, as appears from the following names, which we take almost at random: Crébillon and Ducis, both tragic poets, appealing, the former to terror, the latter to sym-

pathy; Marivaux, whose novels and comedies were very famous in their day, and some of whose plays still keep the stage; Gilbert, a satirist of uncommon power; Le Sage, the author of *Gil Blas*, the most celebrated novel of the age, and of *Turcaret*, perhaps the best comedy next to those of Molière; Beaumarchais, the author of the *Barbier de Séville*; Bernardin de St. Pierre, the author of *Paul et Virginie*; La Harpe, whose *Cours de littérature* was once popular; Duclos, Mlle. Delaunay, and Saint-Simon, whose *Mémoires* gained a deserved celebrity; Barthélemy, who wrote the *Voyage du jeune Anacharsis en Grèce*; Rulhière, a historical essayist; Prévost, who produced the novel of *Manon Lescaut*; Marмонтel, the author of *Bélisaire*; Gresset, the author of *Vert-Vert*; and J. B. Rousseau and Lebrun, the lyric poets. The age was not poetical; poetry had degenerated into verse making, and the verse makers, in imitation of Thomson's "Seasons," indulged in all sorts of descriptive pieces. Delille, the most skilful of them, gained a reputation by various didactic poems, and by translating, not without a certain degree of accuracy, the "Georgics" of Virgil. Florian wrote fables which rank next to those of La Fontaine, and his novels are yet popular. Toward the end of the century imitation was the order of the day, and the only poet who was gifted with originality, André Chénier, died on the scaffold before his best effusions were published.—Neither the revolution nor the empire was favorable to literature. Some tragedies after the classical pattern, among which those of Joseph Chénier may be mentioned, a few light comedies, besides novels and short poems, were not sufficient to relieve the general dullness. Mme. de Staël and Chateaubriand were the forerunners of a revival; but the improvement was perhaps owing less to the *Corinne* and *L'Allemagne* of the former, *Le génie du Christianisme* and *Les martyrs* of the latter, than to the influence upon the public taste of the masterpieces of English and German literature, which found more and more admirers in France. The romantic school now inaugurated a new era. Through the exertions of many young and original writers new life was infused into nearly every branch of literature, poetry, history, philosophy, and the drama. An animated controversy was maintained in pamphlets and periodicals, between the supporters of reform and the adherents of the classical school; but the contest reached its utmost fury when Alexandre Dumas, Victor Hugo, Alfred de Vigny, Frédéric Soulié, and others produced on the stage dramas framed according to their own ideas of the Shakespearian style. The performances of these dramas were indeed regular battles between the opposing literary parties; and it was only at the end of several years that the younger body of combatants came out victorious. Among the plays thus received with both enthusiasm and censure, *Henri III. et sa cour*, *Antony*, *Térésa*,

and *Angèle*, by Dumas, *Hernani*, *Ruy Blas*, *Marion Delorme*, *Lucrece Borgia*, and *Le roi s'amuse*, by Hugo, are still remembered; while numberless pieces, successful at the time, have since fallen into complete oblivion. In fact, the only gain resulting from this protracted dispute was the abrogation of the obsolete rules which had so long regulated the French stage. A reactionary movement was attempted when the illustrious actress Rachel appeared with such striking effect in the tragedies of Corneille and Racine. Ponsard and Latour St. Ybars returned to the old form of tragedy; but the *Lucrèces* of the former and the *Virginie* of the latter enjoyed but ephemeral success, while the "School of Good Sense," as the adherents of this movement were styled, reckons only a few light comedies by Émile Augier. This school had been preceded in the line of tragedy by Casimir Delavigne, who, gradually deviating from the classical model, attempted to reconcile the classic and the romantic systems, in his *Marino Faliero*, *Les enfants d'Edouard* and *Louis XI*. Meanwhile Eugène Scribe was day by day increasing his enormous stock of successful comedies, or rather vaudevilles, on a larger or smaller scale.—Novels, which, with the exception of De Vigny's *Cinq-Mars*, had been scarcely noticed during the excitement of dramatic reform, became the rage as soon as this was on the point of being accomplished. Foremost among the novelists of the present century in point of power and celebrity is the poet and dramatist Victor Hugo, whose *Notre Dame de Paris*, *Les misérables*, *Les travailleurs de la mer*, and *L'Homme qui rit* have achieved a wide renown. George Sand (Mme. Dudevant) acquired reputation by her *Indiana* (1832), and established her claim to be considered one of the foremost writers of her time by her subsequent performances, *Valentine*, *Lélia*, *Jacques*, *André*, *Simon*, *Mauprat*, *Consuelo*, *Le champi*, *La mare au diable*, *La petite Fadette*, *La filleule*, *L'homme de neige*, and by her *Histoire de ma vie*. Alexandre Dumas, the inexhaustible story-teller, won unequalled popularity by his *Trois mousquetaires*, *Vingt ans après*, *Le vicomte de Bragelonne*, *Le comte de Monte Cristo*, *Joseph Balsamo*, *Le collier de la reine*, *Angé Pitou*, *La comtesse de Charny*, and other romances, in all filling more than a hundred volumes. Eugène Sue also achieved great popular success with *Les mystères de Paris*, *Le Juif errant*, and *Martin l'enfant trouvé*, depicting in glaring colors the miseries of society. Honoré de Balzac undertook to present, under the title of *La comédie humaine*, a daguerrotype of every aspect of French society during his time; this immense work was interrupted by death; but some parts of it, complete in themselves, are invaluable for depth of observation and acuteness of delineation: *Eugénie Grandet*, *Le père Goriot*, *La recherche de l'absolu*, *Le contrat de mariage*, *Modeste Mignon*, *Les parents pauvres*, *Les scènes de la vie privée*, &c.

Frédéric Soulié, who, although his popularity is not as great, is nearly the equal of those we have just named, evinced uncommon talents in his historical novels of southern France, among which *Le vicomte de Bézières* specially deserves to be mentioned. Still greater power characterized his pictures from the social world: *La lionne*, *La comtesse de Montrion*, *Diane et Louise*, *Le lion amoureux*, and *Les mémoires du diable*. Alphonse Karr, in his *Sous les tilleuls*, *Midi à quatorze heures*, *Geneviève*, *Clotilde*, and numerous short tales, has given unrivalled specimens of good sense, fine feeling, and genuine humor. By the originality, delicacy of style, and charm of fancy which Alfred de Musset displayed in his *nouvelles*, such as *Frédéric et Bernerette*, *Emmeline*, *Les deux maîtresses*, *Le fils du Titien*, and *Mimi Pinson*, he is entitled to a high rank as a novelist. Such is also the case with Prosper Mérimée, whose *Chronique du temps du Charles IX.*, *Colomba*, *Le cas étrusque*, and *Arsène Guillot* are gems of their kind. Prominent among the comic writers was Paul de Kock, whose novels were nearly as numerous as those of Dumas, and who wrote also many vaudevilles. Besides these masters of novel writing we can merely mention their contemporaries, Mme. Charles Reybaud, Mme. Émile de Gifardin, Théophile Gautier, Charles de Bernard, Élie Berthet, Ponsard du Terrail, Jules Sandeau, Émile Souvestre, Paul Féval, and Méry. Among the later novelists, Henri Murger, Alexandre Dumas fils, Léon Gozlan, Arsène Houssaye, Champfleury, Ernest Feydeau, Gustave Flaubert, Émile Gaboriau, Octave Feuillet, Hector Malot, Edmond About, Cherbuliez, and the literary partners Erckmann-Chatrian, deserve mention. Jules Verne has written remarkable scientific romances, which have been translated into English and widely read. Of nearly the same class are the fanciful scientific works of Guillemin and Élysée Reclus.—Poetry is far from being as popular in France as the novel, and poets have been and are still very slightly regarded by the public; but four of them have such claims to admiration as to be dear even to the least poetical minds; these are Béranger, Lamartine, Victor Hugo, and Alfred de Musset. The first named, who wrote nothing but songs, is at once the most national and the most popular of all, as well as the best known in foreign countries. Although song-makers are numerous in France, there is only one who deserves to be mentioned after Béranger; this is Pierre Dupont, who, however, stands far behind his master, Lamartine, whose effusions present a combination of harmony, human feeling, and religious sentiment, is the favorite of minds that incline to sentimentality and reverie. His *Méditations*, *Harmonies*, and *Recueils poétiques*, his *Jocelyn* and *Chute d'un ange*, are still read and admired. Victor Hugo, though a leader in all departments of French literature, has not been less successful as poet than novelist. His *Odes et ballades*, *Orientales*,

Feuilles d'automne, *Chants du crépuscule*, *Voix intérieures*, *Les rayons et les ombres*, and *Contemplations* are poems of sentiment and fancy; while his *Châtiments* are bitter satires against Napoleon III. and his associates. His latest poem, *L'Année terrible*, is a passionate lament for the misfortunes of France in 1871. In 1874 he published a novel called *Quatre-vingt-treize*, which delineates the great year of the first French revolution, 1793. Alfred de Musset, perhaps the most original of the four, is less known than either of them outside of France, but in his own country his reputation is very high. Among the other poets, Casimir Delavigne, whose *Messéniennes* rivalled for a while the success of Lamartine's *Méditations*, Auguste Barbier, the author of the *Iambes*, Victor de La Prade, and the brilliant and original Théophile Gautier, must not be omitted. Nor must we fail to mention Jamin, the barber poet, whose writings in the *langue d'oc* have made him popular in the south of France and famous abroad. Frédéric Mistral, a Provençal writer, has acquired a unique reputation by his works in the language of his native province.—History is undoubtedly the most successful branch of modern French literature. A larger number of valuable historical works have been published within the last 50 years than during any other equal period of time; and the taste for such performances is still on the increase. M. Guizot, the great philosophical expounder of social institutions and moral revolutions, and Augustin Thierry, the artistic historian of the middle ages, stand foremost among the promoters of this historical movement. The *Essais sur l'histoire de France*, by the former, the *Histoire générale de la civilisation en Europe* and *Histoire générale de la civilisation en France*, which he wrote before engaging actively in political life, and his *Histoire de la révolution d'Angleterre*, which he completed after leaving the ministry in 1848, are monuments of philosophical history; while the *Lettres sur l'histoire de France* of Augustin Thierry, his *Histoire de la conquête de l'Angleterre par les Normands*, his *Récits des temps mérovingiens*, and his *Histoire de la formation du tiers-état en France*, present a happy combination of dramatic narrative and perspicuous discrimination. Amédée Thierry, Augustin's brother, presents lively pictures of Gaul and other countries before and during the fall of the West Roman empire. Three writers have devoted their efforts to a full recital of the general history of France: Sismondi, whose voluminous work is an inexhaustible mine of knowledge and thorough research; Michelet, who combines the profound learning of a Benedictine monk with the humorous fancy of a poet; and last but not least, Henri Martin, who, under the impulse of patriotic enthusiasm, has successfully embodied in his book the results of modern science, while infusing into its pages a lively and never slackening interest. Barante, after giving (1824-'6) in his *Histoire*

des ducs de Bourgogne an attractive specimen of purely narrative history, published histories of the French convention and of the directory, in which, though he is accurate and impartial, his monarchical predilections are strongly apparent. Capefigue, who died toward the end of 1872, wrote voluminously on the reactionary side of French history from Philip Augustus to Louis Philippe. The revolutionary period has engaged the attention of many historians, among whom the most prominent are Thiers, Mignet, Michelet, and Louis Blanc. The first, by his *Histoire de la révolution*, at once gained a popularity which gave him an introduction into political life. His subsequent *Histoire du consulat et de l'empire* has given him a still higher rank as a writer, though not as an impartial and trustworthy historian. The histories of Michelet and of Louis Blanc, who has also written a brilliant *Histoire de dix ans* (1830-'40), besides several other works, are marked with strong democratic opinions; while that of Mignet, a vivid yet substantial sketch, bears the impress of philosophical impartiality. This writer has also produced several miscellaneous historical works which are highly valued: *Histoire de Marie Stuart*; *Charles Quint, son abdication et sa mort*; *Philippe II. et Antonio Perez*; and a large compilation, *Histoire des négociations relatives à la succession d'Espagne*, containing beautiful narratives, preceded by an admirable introduction. Lamartine also figures among the historians; his *Histoire des Girondins*, which appeared in 1847, created a deep sensation by its magnificent style and enthusiastic spirit. He subsequently published the *Histoire des constituants*, *Histoire de la restauration*, *Histoire de Turquie*, &c., more remarkable for showy eloquence than soundness and accuracy. Napoleon III. deserves to be mentioned among the historians for his *Histoire de Jules César*, two volumes of which were published in 1865-'6. Great historical publications have appeared under the patronage of the government or of learned societies, the *Collection des historiens de France*, and the *Histoire littéraire de la France*, among the number. Villemain ought to be reckoned among the historians, not only for his *Histoire de Cromwell*, but for the admirable pictures of men and society in his excellent *Tableaux de la littérature*, and his *Soutenirs contemporains*. Vaulabelle has written an excellent *Histoire de la restauration*, which deserves more fame than it has gained. Lanfrey's historical works are eminently judicious; his *Histoire de Napoléon* has attracted much attention both at home and abroad by its new views about the great emperor. Taxile Delord's *Histoire du Second Empire* is equally judicious and more impartial. Garnier-Pagès completed in December, 1873, a history of the revolution of 1848.—Archæology, to speak only of productions of this century, has not been neglected, as is evidenced by the works of Letronne, Raoul-

Rochette, and more recently by those of Beulé, Belloguet, De Rivière, Lartet, and Quatrefages. Champollion threw new light upon ancient Egypt by his system of deciphering hieroglyphics. The study of oriental languages, promoted by Sylvestre de Sacy, has been successfully continued by De Saulcy, Ménant, Oppert, and Renan, in the Semitic languages. Lenormant, Mariette, Chabas, and De Rougé have distinguished themselves as Egyptologists. The works of Abel de Rémusat, Stanislas Julien, Burnouf, De Rosny, and Hervey de St. Denys are valuable contributions to the occidental knowledge of the Chinese, Japanese, and Sanskrit.—Philosophy was brought back to spiritualist principles by the natural reaction against the materialism of the preceding age. This revolution, prepared by Royer-Collard, Maine de Biran, and others, has been accomplished by Victor Cousin and his disciples, who, under the name of eclecticism, unfurled the banner of spiritualism. The eloquent lectures which Cousin delivered at the Sorbonne exercised a powerful influence over the rising generation; they have been printed, with corrections and considerable additions, under the title of *Cours de philosophie, Fragments de philosophie, and Du vrai, du beau et du bien*. Jouffroy and Dami-ron, who acknowledged him as their master, contributed to the progress of the same doctrines, which were advocated by Cousin's younger disciples, Émile Saisset, Amédée Jacques, Vacherot, Paul Janet, Adolphe Franck, and Jules Simon. The books of the last named, *Du devoir, De la liberté de conscience, and De la liberté*, are among the most meritorious performances for healthfulness of tone, honesty of purpose, and generosity of mind. Besides the eclectic school, four philosophers of great originality and uncommon power have shone each in his own sphere, viz.: Joseph de Maistre, the zealous apologist of absolute power, in his treatise *Du pape*, and the eccentric author of the *Soirées de St. Pétersbourg*; Bonald, who in his *Législation primitive*, as well as his other philosophical writings, upheld the cause of monarchy and the church; Ballanche, the mystic dreamer, who in his *Palingénésie sociale* attempted to represent through a series of symbolical narratives couched in a poetical style the various phases of the history of mankind; and Lamennais, who, at first a bold and independent defender of the papal power, was gradually led to become the advocate of pure democracy. His *Essai sur l'indifférence en matière de religion, Les paroles d'un croyant, Le lièvre du peuple, Une voix de prison, and Esquisses d'une philosophie*, show the various steps of this transformation, while they are placed among the masterpieces of French eloquence. The *Cours de philosophie positive* of Auguste Comte offers a system of philosophy which has found many disciples in other countries, especially in England and America. Among the writers on social science, Saint-Simon and Fourier are incontrovertibly the

most conspicuous; and although their doctrines have been rejected as a whole, they have exercised a powerful influence over the age. Pierre Leroux, Louis Blanc, and Proudhon may be mentioned as in some sort their disciples. The historian Michelet and Edgar Quinet take rank among fanciful philosophers by a number of publications.—The various branches of natural science boast of many original and powerful writers, at the head of whom we must place Georges Cuvier, author of *Le règne animal distribué d'après son organisation, et Recherches sur les ossements fossiles*, with an admirable introduction entitled *Discours sur les révolutions du globe*. Cuvier's great contemporaries Lamarck, Jussieu, De Candolle, Lacépède, and Latreille, and rival, Étienne Geoffroy Saint-Hilaire, must be mentioned with him. The son of the latter, Isidore, is worthy of his father, and many disciples of these great men, among whom are Duméril, Jussieu, and Alcide d'Orbigny, have published brilliant scientific works. Mineralogy boasts of Élie de Beaumont, Beudant, and Dufrénoy; chemistry especially of Lavoisier; and chemistry and physics of Thénard and Dumas, Gay-Lussac, Berthollet, Despretz, Pasteur, Berthelot, Chevreuil, and Dumas. French medical literature is particularly rich, from the contributions of Bichat, Broussais, Corvisart, Magendie, Trousseau, Claude Bernard, and many others. Mathematical sciences have distinguished representatives in Lagrange, Laplace, Ampère, Biot, Le-verrier, and especially Arago, who has no equal for clearness of exposition and perspicuity of style. Among the travellers of this century whose writings have been of most service to science or who have attracted particular attention are Bonpland, Freycinet, Duperrey, Dumont d'Urville, René Caillé, Victor Jacquemont, Fontanier, Father Huc, Dubois de Montpreux, Saint-Martin, Marcoy, D'Abbadie, and De Beauvoir.—Many able pens have been devoted to political economy and philosophy: Michel Chevalier, whose *Lettres sur l'Amérique* have made him known in the United States, Léon Faucher, Rossi, Adolphe Blanqui, Frédéric Bastiat, André Cochut, De Beaumont, and De Tocqueville. The last is well known in America by his singularly philosophic treatise *De la démocratie en Amérique*. The admirable historical essays of Laferrière upon French jurisprudence must not be forgotten. The political writers who deserve to be named, even after the interest of the daily questions they treated is gone, are numerous. Among them are Armand Carrel, the model journalist Courier, and Cormenin, his imitator, perhaps his equal in point of pungency and wit, though far from possessing the same classical perfection. The French essayists and literary critics are a legion. Among the most prominent we may mention Sylvestre de Sacy and Saint-Marc Girardin, who were admitted to the French academy, the former merely as a journalist, the latter on account of his versatile talents

as a political writer, able critic, and elegant lecturer; Philarrète Chasles, Prévost-Paradol, Cuvillier-Fleury, Ernest Renan, Hippolyte Rigaud, Henri Taine, Edmond Scherer, Caro, and Jules Janin, the feuilletonist. Gustave Planche and Sainte-Beuve are entitled to a prominent place in this class of writers; the former was a sound and unsparing critic, in the fine arts as well as literature; the latter excelled in the delineation of literary characters, and also published a *Tableau de la poésie française au 16^e siècle* and a history of the Port-Royalists. Charles de Rémusat and Albert de Broglie have treated historical matters from a philosophical or religious point of view. Théophile Gautier, Edmond About, Paul de Saint-Victor, Léon Delaborde, Vitet, and Delécluze have particularly devoted themselves to fine-art criticism; Delécluze, Fétis, Hector Berlioz, Fiorentino, and Scudo, to musical matters. Of recent writers, Ernest Renan by his *Vie de Jésus*, *Les apôtres*, *Saint Paul*, and *L'Antichriste*, and Hippolyte Taine by his *Histoire de la littérature anglaise* and works on art, have attracted much attention throughout the civilized world. Of late years public affairs and political questions have so much occupied the mind of France that literature has languished; and although there has probably been no falling off in intellectual activity, the rising generation of writers do not seem on the whole to equal their predecessors.—See *Histoire littéraire de la France*, by Dom Rivet and other Benedictine monks, continued by members of the institute (22 vols. 4to, 1738–1858); *La France littéraire* (1826–'42), and *La littérature française contemporaine* (1837–'44), by J. M. Quérard; *Histoire littéraire de la France avant le 12^e siècle*, by Ampère (3 vols., 1838–'40); *Tableau de la littérature au moyen âge*, by Villemain (2 vols. 12mo, last ed., 1857); *Essais sur l'histoire littéraire du 16^e siècle*, by Saint-Marc Girardin and Philarrète Chasles (1827); *Tableau de la poésie française au 16^e siècle*, by Sainte-Beuve (1828); *Histoire de la littérature française*, by Demogeot (new ed., 1857); *Histoire de la littérature française*, by D. Nisard (last ed., 1867); *Catalogue général de la librairie française*, from 1840 to 1865, by Otto Lorenz (1871); and *Études sur la littérature contemporaine*, by Edmond Scherer (1872–'3).

FRANCE, Wines of. In respect to soil, climate, and the abundance and variety of the wines which she produces, France has been called the vineyard of the earth. Nearly seven eighths of her territory is grape-bearing, and the products of her vines being for the most part but slightly alcoholic, her people are, as a rule, wine drinkers without being addicted to intemperance. With the exception of the extreme northern and northwestern departments, the whole country is more or less devoted to the culture of the grape; but as certain soils and exposures are better adapted to that purpose than others, the wines of high commer-

cial value are produced in limited and comparatively isolated districts. By far the greater part of the French vintage is consumed within the country, or is mixed with or employed to imitate various wines of established reputation. The total product of the country amounts to between 1,500,000,000 and 2,000,000,000 gallons, worth about \$350,000,000.—First in importance as an article of commerce, and in the estimation of connoisseurs for their intrinsic excellence, are the wines produced in the department of Gironde, a part of the old province of Guienne, of which Bordeaux is the capital; whence the district is also viticulturally known by its old name of the Bordelais. Gironde is practically divisible into five wine-producing districts: Médoc, a strip of territory on the left bank of the river Gironde, extending from Blanquefort, near Bordeaux, to the sea; the Graves, or high plains near the confluence of the Garonne and the Dordogne; the Côtes, or slopes on the right bank of the Garonne; the Palus, or low marshy territory on both banks of the Garonne, in the immediate neighborhood of Bordeaux; and the district of Entre-deux-Mers, or low lands between the Dordogne and Garonne. Within this area more than 350,000 acres are devoted to vineyards, whose annual production exceeds 50,000,000 gallons, five eighths of which are red and three eighths white wines, worth \$56,000,000. The poorest kinds are sold at less than a franc the gallon, while the best fetch in favorable seasons considerably more than 20 francs. The distinguishing qualities of the wines of Gironde are purity, subastringency, lightness, and fragrance. In its general features Médoc is a long, narrow plain, inclining somewhat to the Gironde, and containing about 45,000 acres of vineyards, producing annually 8,000,000 gallons. Of these nearly one eighth are high-class wines, an equal amount are simply fine wines, and the remainder are ordinary qualities. The two first mentioned grades yield a net product of about 5,000,000 bottles. They are red in color, and, notwithstanding a slight characteristic roughness, have great flavor and strength without being intoxicating, and after lying several years in the bottle acquire a delicious bouquet. They not only bear transportation better than other French wines, but are even improved by long sea voyages. It is customary to arrange them in three categories: 1, the classified wines, of which there are about 60 growths recognized by the commerce of Bordeaux; 2, the citizen or bourgeois wines; 3, the peasants, or wines of the small proprietors. The classified growths are again subdivided into four or five kinds, the first of which comprises the celebrated first three growths (*les trois premiers crus*) of the whole Médoc, viz., the Château Margaux, Château Lafitte, and Château Latour, which are of equal excellence and of enormous price even in France. In this division it is also customary to include the Château Haut-Brion, a red

wine of great richness and delicacy belonging to the neighboring district of Graves. Among the second and other growths, well known and excellent wines are the Mouton, Léoville, Gruau-Larose, Pichon-Longueville, Cos-Des-tournel, Pontet-Canet, Château de Beycheville, &c. To all red wines exported from Médoc, and in fact from the whole Bordelais, to Great Britain and the United States, it has long been customary to apply the general name of claret, derived from the French *clair-et*, which simply means a clarified wine. The product called claret is, however, properly a mixture of several kinds of wine, the strong-bodied varieties of Spain and southern and southeastern France being mingled with the ordinary growths of Gironde, to suit the English and American palate. The term is unknown in France. A comparatively small amount of genuine Médoc wine reaches this country, as the popular taste here inclines to a factitious, reinforced wine, having body and spirituous strength, rather than to the natural product of the vineyards. The same may be said of Great Britain, notwithstanding she is the principal consumer of the first-class wines of Médoc. The amount of mixing carried on at Bordeaux is prodigious. Her exports of wine are twelve times greater than the production of the entire Médoc, and half of these exports sell as Bordeaux wine; so that it is fair to assume that the growths of Gironde are several times multiplied by the addition or substitution of other wines. There are 42 communes in Médoc in which wine is made, from each of which the wine takes its name, although the grand wines are named after the estates on which they are made. A Margaux wine means a wine from the commune so called, and must not be confounded with Château Margaux, which is wine from a particular estate in that commune. Other familiar names are Pauillac, in which Château Lafitte is situated, St. Julien de Reignac, and St. Estèphe. South of Médoc lies the district of Graves, which produces wines, both red and white, of greater body and more spirituous than those just described, and bearing some resemblance to the growths of Burgundy. The best of the red wines is the Haut-Brion, heretofore mentioned. The district of Sauternes, a prolongation of that of Graves, extending along the left bank of the Garonne, produces exclusively white wines, the best of which, though of delicate flavor and pure aroma, are excessively sweet in comparison with the wines of Médoc. The latter quality has been given to them of late years by the makers in consequence of the growing demand for sweet Sauternes wines in Russia. The poorer grades of Sauternes are thin and acidulous. The principal growths of the district are the Barsacs, Bommes, and Sauternes, the first of which produces the Château Coutet, the second the Château La Tour Blanche, and the third the world-renowned Château Yquem, which sells for from 12,000

to 15,000 francs the *tonneau* of 200 gallons at the vineyard, and is esteemed almost too costly for use. The wine of Château Suduiraut, of the Preignac growth, also very celebrated, is worth not above 4,000 to 5,000 francs the *tonneau*. The remaining districts of Gironde produce wines of a quality considerably inferior to those above described. The best are grown in the vineyards of St. Émilion, in the valley of the Dordogne, and differ considerably from the Médoc wines, recalling many of the qualities of fine port wine. Adjoining St. Émilion is the district called Libournais, and N. W. of that, on the right bank of the Gironde, are Fronsadais and Blayais, yielding considerable quantities of red and white wines of good quality, much of which is exported under various names to America.—Roussillon, formerly a province in the extreme southern part of France, but now merged in the department of Pyrénées-Orientales, contains about 130,000 acres of vineyards, which produce liqueur wines, dry wines, and a number of sound, full-bodied varieties, employed, with the addition of spirits, in the manufacture of imitation port and similar wines. The most esteemed growths of the first class are the muscat, the Malvoisie, and the Maccabéo, which are for the most part sweet, rich in aroma, and fiery. There is but a limited demand for them in France, and the greater part go to Russia and America. North of Roussillon lie the departments of Aude, Hérault, and Gard, forming part of the old province of Languedoc, in which more than 650,000 acres are devoted to vineyards. The wines are rich in color, spirituous, and full of body, but coarser and less finely flavored than those of Gironde, and are exported to all parts of France to be mixed with the Burgundies, Bordeaux, and other famous growths. They are generally called *vins du midi*, wines of the south, and are classified as wines for distillery and wines of commerce, the latter being again subdivided into fine and ordinary red, and white dry and white liqueur and muscat wines. The choicest growths are found in the departments of Hérault and Gard, the former of which is said to yield more wine than the whole kingdom of Portugal. The St. Gilles wines, made in Gard, are of a brilliant purple color and possess unusual strength and body, which qualities they impart to weaker wines, whence they are called *vins fermes* and *vins de remède*. Not a little of the so-called sherry and port wine of commerce is manufactured from the St. Gilles. The luscious and fragrant Frontignans and Lunels, which are made from muscat grapes, belong to Hérault, and were once in great favor as liqueur wines. Large quantities of alcohol are also distilled in this department, most of which is sold in France. The department of Basses-Pyrénées produces about 10,000,000 gallons of wine, of which the growths of Jurançon and Gan, red and white, are most esteemed. In addition to the districts above mentioned, every de-

partment of southern France produces wines of a similar character, but generally of an inferior quality, which serve their purpose as *vins de remède*.—To the valley of the Rhône belongs another division of wines, the greater and more reputed part of which are produced on the right bank of the river. The Côte du Rhône, as that part of the department of Gard is called which borders on the Rhône, produces red and white wines not unlike those of St. Gilles, but of finer quality. On the left bank of the river, in the neighboring department of Vaucluse, are the vineyards of Châteauneuf-du-Pape, the wines of which, being spirituous and dark-colored, are exported in large quantities to Bordeaux and Burgundy to be mixed with the poorer growths of those districts. Further up the Rhône, on its right bank, in the department of Ardèche, are produced the white wines of St. Péray, both dry and effervescent. The former are spirituous, delicate, and of an agreeable bouquet; the latter heady and sweet, but the sweetness arises from the natural juice of the grape, and not from the addition of sugar, whence it is considered more wholesome than champagne. Crossing to the left bank of the Rhône again, we find at Tain, in the department of Drôme, which is a part of the old province of Dauphiny, the famous vineyards of the Hermitage, so called from the retreat which one Gaspard de Sterimberg, a courtier of Queen Blanche of Castile, is said to have built early in the 13th century on a lofty, round-topped hill rising abruptly from the river. Its S. and S. W. sides descend in a series of terraces to the river level, and are covered with vines on which the sun plays the whole day, maturing the juices of the grapes to absolute perfection. The vineyards are of three kinds, according to the soil of which the terraces are composed, and the high quality of the wine depends upon the combination of the growths of these vineyards, which are always sold mixed; so that a proprietor, in order to have his produce classified as of first quality, must hold property in the three vineyards. Nine tenths of the wines are red. The first growths are sent to Bordeaux to be mixed with the clarets which are made up for the English market, and only the second growths are sold in the trade as Hermitage. But these, when genuine, are esteemed the best wines of southern France, being distinguished by body and richness, a lively purple color, and a peculiar bouquet. The white Hermitage is of great rarity and delicacy, and will keep for 50 years. The vineyards of Condrieu, in the department of Rhône, south of Lyons, produce a white effervescent wine of luscious taste and agreeable aroma, which is described as an imperfect champagne. In the commune of Ampuis, a few miles distant, is the vineyard of the Côte-Rôtie, literally the "burnt side," which has an exposure scarcely less favorable than that of the Hermitage. It produces red wines, of remarkable clearness, strength, and bouquet,

the first quality of which ranks among the best in France. North of Lyons and along the Saône and other tributaries of the Rhône lie the districts of Beaujolais, Mâconnais, and Côte de Châlon, the wines of which, while differing in many respects from those of Burgundy and the valley of the Rhône, may be said to form a connecting link between them. The Beaujolais, formerly part of the province of Lyonnais, but now mainly forming an arrondissement of which Villefranche is the chief place, lies between Mâcon and Lyons on the right bank of the Saône. The district being hilly in parts, the vineyards are designated as high or low Beaujolais, according to their situation and elevation. The low Beaujolais produces a greater quantity of wine, but of a coarser quality, than the high. The best growths are those of Chénas, Fleury, Lanciaé, and St. Étienne-la-Varenne, light-colored wines, and the Julliénas, which represents a class of fine, strong, and deep-colored wines. The products of the Beaujolais are as a rule more acid and delicate than those of the valley of the Rhône, and are largely consumed in France. The Mâconnais is the district lying around Mâcon, and immediately N. of the Beaujolais. It formed part of ancient Burgundy, and its wines are regarded as a species of second class Burgundies. They are both red and white, the former class greatly predominating in quantity but not in quality. The best red growths are those of Thorins, Romanèche, St. Amour, and Davayé, the finer grades of which are not unfrequently taken into Burgundy and sold as wine of that country. Much of the red Mâcon is alcoholic and exceedingly acid; but the latter quality, the result of unscientific methods of making the wine, is not considered an objection by the natives, who almost invariably drink their wine mixed with water. White Mâcon is produced in the vineyards of Pouilly and Fuissé, in the extreme northern part of the district. The Pouilly wine is the finest product of the Mâconnais, and in good years is scarcely surpassed by any wine made in France. It is dry, of a deep golden hue and a superb bouquet, but, like all the wines of the district, is a little too heady. The Fuissé is inferior in quality, and mostly used to mix with the Pouilly. The remaining wines of the Saône valley are those of the Côte de Châlon, under which name are comprised the vineyards of the arrondissement of Châlon-sur-Saône. The best growths have an admirable exposure and are nearly related to the Burgundies properly so called, but, owing to a vicious system of culture, are of vastly inferior quality. The best of them are employed to mix with Burgundies.—The Burgundy wine district is often popularly described as comprehending the departments of Yonne, Côte-d'Or, and Saône-et-Loire, which were all included in the ancient province of Burgundy. But the greater part of the last named department is monopolized by the Mâcon and Côte de Châlon wines, which are not true Burgundies; and the products of Yonne bear no closer rela-

tion to the latter than do those of Saône-et-Loire. This restricts the production of genuine Burgundy wines to the department of Côte d'Or, literally the "golden side," so called from a series of low hills, about 36 miles in length, which stretch from the neighborhood of Châlon-sur-Saône, through the heart of the department, to Dijon. Along the slopes of this ridge, which has a general S. S. E. exposure, lie the vineyards and estates, frequently extending a mile or two on the plain beneath, which produce the famous growths of Burgundy. These may be divided into two classes, of which the finer includes Chambertin, the favorite wine of Napoleon I., Richebourg, Corton, Tâche, Romanée de St. Vivant, Romanée Conti, and Clos de Vougeot, all of superlative excellence and enormous price, and some of them of very limited supply. The Clos de Vougeot vineyard, one of the largest, contains not above 120 acres, some of which is poor land, while the Chambertin contains less than 12, and the Romanée Conti only $\frac{3}{4}$ acres. With so limited an area of production, the choice growths of Burgundy are necessarily rarely met with. Next to these come the wines of Nuits, Volnay, Pommard, Beaune, Vosne, Chambolle, and a number of other vineyards, which are little inferior to those of the first class. These wines are all red and are distinguished by suavity of taste and spirituous bouquet. They possess more body than the wines of the Bordelais, and are more heating; but the popular objections to them, that they cause gout and will not bear transportation, are not entirely sustained. Good Burgundy is exported to many parts of the world, and everywhere is held in equal esteem with the best Bordeaux wines, although in the opinion of experts it can only be drunk in absolute perfection in or near the district in which it is produced. This may account for the fact that it is much less frequently found in America than the wines of Bordeaux. As to its effects upon the physical system, it may suffice to say that the proportion of gouty persons is no greater in Burgundy, where the wine is universally drunk, than in parts of Europe where it is comparatively unknown. A marked peculiarity of the Côte d'Or is that it produces not only some of the best wines in the world, but some of the worst. Owing to rude and primitive and often filthy processes of promoting the fermentation of the grape juice, which are in a measure common to all the vineyards of the department, a large proportion of the wine has a harsh, disagreeable taste, and will not keep; and it is said that there is not an inn or hotel along the Côte in which a bottle of Burgundy fit for travellers to drink can be obtained. An improvement in the making of the wine may not materially increase the production of the first growths, but it would greatly aid the reputation of the lower grades. The white wines of Burgundy are less numerous than the red, and less known outside of France. The purest is the Mon-

trachet, produced in the Côte d'Or, which is noted for its combination of body and strength with an exquisite bouquet; after which rank the products of the vineyards of La Perrière, La Combotte, and La Goutte d'Or at Meursault. In the department of Yonne is produced an extensive class of white wines, bearing the general name of Chablis, of various degrees of excellence and generally of agreeable flavor. They are much exported to England and America, and are often described as a species of Burgundy. They can, however, lay no better claim to this title than the wines of the Maconnais or even of the Beaujolais.—Of all the wines of France, the products of the Champagne country are the most popular and widely distributed, although, in consequence of their costliness, they are perhaps not so generally consumed as the wines of Gironde. As early as A. D. 280 the district was noted for its red and white wines, but it was not until the close of the 17th century that the effervescent product known as *mousseux*, the typical champagne of the present day, was discovered. Since that time the productiveness of the district has enormously increased, and the processes of manufacture have reached a high degree of perfection. The old province of Champagne is now distributed among several departments and portions of departments, all wine-producing; but in only one of them, that of Marne, is the champagne of commerce made. The wines of the other departments have for the most part a local reputation, and are consumed in the immediate neighborhood. Marne is subdivided into five arrondissements, two of which, Rheims and Épernay, are the true seats of the champagne wine manufacture. The vineyards of Rheims are situated around the slopes of a wooded mountain, called the *bois et montagne de Rheims*, and comprise the famous growths of Verzenay, Bouzy, Ay, Verzy, Ambonay, Trepail, Mailly, and some others. Those of Épernay lie south of the Marne and occupy an undulating plain extending to the forest of Vertus. Of this district the town of Épernay is the centre. Hence the champagne product of Marne may be divided into two classes, the *vins de la montagne*, or mountain wines, and the *vins de la rivière*, or river wines. The total vintage of Marne is about 80,000,000 bottles, somewhat more than one fourth part of which is champagne wine made in Rheims and Épernay. The champagne vintage begins in the latter part of September and extends into October. The grapes, after careful selection, are subjected to three or four pressings, of which only the first three are employed to make wine of good quality. The process must be performed with rapidity, or the must will become colored. The must obtained by the first three drawings is put into large vats, where during the next 12 or 18 hours it develops a froth on the top and deposits a mucous matter at the bottom. Having been freed from both of these impurities, it is drawn into barrels

holding 44 gallons each, and there left to ferment. The residue of the grapes left in the press after the first drawings is used for making a common red wine. About the beginning of December the wine, being then clear, is drawn from the lees, and the mixing of various growths, the first important operation in the production of champagne, commences. This process requires great skill and judgment, for upon its successful performance the flavor and body of the wine in great measure depend. Champagne is seldom the product of a single vineyard, but is a combination of a number of growths. In this respect it holds a peculiar position among French wines. The growths having been mixed in large vats in the proportions determined upon by the manufacturer, the combination is again drawn into barrels, where it is fined, after which it is allowed to rest until the spring. Up to this time the wines are rarely tampered with by the introduction of sugar or brandy; but in unfavorable seasons the former substance is sometimes necessary to enable them to undergo the operation of a second fermentation, without which it is impossible to make them sparkle (*mousser*). Next comes the operation of bottling, which commences in April and continues until June. The liquid is now of a uniform amber color, and, if of good quality, will be not unpalatable. The bottles, which are the same as those from which the wine is drunk when finally prepared for drinking, are filled to within an inch or so of their mouths and then corked. The corks having been fastened down securely with string and wire, or by the more recent method with clasps, the bottles are conveyed into cellars or caves and laid carefully on their sides. The secondary fermentation ordinarily commences in June and continues during the summer, pending which, especially when the grapes begin to ripen, or in stormy weather, a loss estimated at from 10 to 15 per cent., and sometimes reaching 25 per cent., is sustained by the bursting of the bottles and the consequent escape of the liquor. When the fermentation is finished and the breakage has nearly ceased, the stacks of bottles are overhauled, and those bottles in good condition are restacked. After a lapse of 18 months, during which the wine is allowed to lie at rest, it is shaken at intervals for several weeks, until a thick deposit is found in the neck of each bottle, which is removed by the process of disgorging. The cork is discharged with a loud report, and the froth, which immediately rises and is partly projected, carries with it all the impurity collected in the neck. Champagne prepared in this manner is quite dry, containing no sugar whatever perceptible to the taste. But a further operation is necessary in order to prepare it for exportation or commerce. This consists in adding to each bottle a certain percentage of melted rock candy mixed with brandy or some finely flavored wine. The amount introduced varies according to the country in which the

wine is to be consumed, England using the minimum and Russia the maximum. The bottles are then recorked, and secured by strings and wire or clasps, and the air is excluded by covering the necks with tin foil or sealing wax. The wine is now between two and three years old and ready for use. Of the bottled wines produced in Champagne four varieties are known to commerce: 1, *champagne non-mousseux*, or still champagne, that is, wine which has been fully fermented, fined, bottled in the usual manner of mousseux wines, and allowed to rest a long time; 2, *champagne crémant*, which forms a slight cream of effervescent bubbles upon its surface when poured into a glass; 3, *champagne mousseux*, which upon being opened projects the cork with an audible report, and rises gently over the mouth of the bottle; and 4, *champagne grand mousseux*, which projects the cork with a loud report and immediately overflows from the bottle. The prices of champagne vary at the place of manufacture from \$4 the dozen bottles to \$18 or \$20, but \$10 will give the consumer a sound wine of excellent quality. Of the 25,000,000 bottles or upward annually produced, one sixth part goes to the United States; England, Russia, and the East Indies consume each about the same quantity; and the remainder is distributed among other European countries. Most of the wine sent to the United States purports to come from Rheims, although in fact it is the product of vineyards scattered throughout the arrondissements of Rheims and Épernay; and its reputation rests upon the names of its manufacturers rather than upon the locality where it is produced. As a remedial agent, champagne, though a factitious product, is highly esteemed for its diuretic and strengthening properties. It comforts and rests the stomach, and is a recognized antidote to nausea.—To the wine districts above described it is necessary to add but a few others. The department of Dordogne, the ancient province of Périgord, which lies E. of the Bordelais, yields red and white wines, of which the former resemble St. Émilion, while the latter partake partly of the qualities of Frontignac and partly of those of Barsac. Bordeaux is the principal receptacle for the wines of this district. The department of Vienne, formerly Haut-Poitou, produces about 12,000,000 gallons of mediocre quality. The departments of Lot and Lot-et-Garonne, lying S. of Dordogne, form an extensive wine-producing district, of which Cahors is the central point. The wines are white, rose-colored, and black, and much of the last named variety is sent to Bordeaux to strengthen and color light wines. The Cahors wines have little bouquet, but are strong in body, and the dark varieties will keep 50 years in the bottle. The department of Charente, lying N. of Dordogne, and through which flows the river Charente, is largely devoted to the culture of the vine. The wines are used for distillation immediately after the

fermentation is over, and from them is produced the best brandy made in France. The centre of this manufacture is the town of Cognac, whence the name frequently applied to French brandies.

FRANCHE-COMTÉ (free county), an ancient province of France, now comprised in the departments of Jura, Doubs, and Haute-Saône. Its capital was Besançon. It is drained by the Saône, Doubs, and Ain, is partly covered with forests, and contains iron and coal mines, marble quarries, and salt pits. The country was originally inhabited by the Sequani, and was called *Maxima Sequanorum* by the Romans. In the 5th century it was occupied by the Burgundians, and subsequently became a part of the Frankish dominions. After the disruption of the Carolingian empire it passed through various changes, finally falling to the German empire. It was then governed by its own counts, although the name of Franche-Comté does not occur until near the middle of the 12th century; the origin of this name is attributed to the freedom of the country from all taxes and imposts, save a certain sum granted annually to the sovereign under the title of a free gift. A little later it was also styled the palatine county of Burgundy. In 1384 it fell to the Valois house of Burgundy in consequence of the previous marriage of Margaret of Flanders with Philip the Bold. On the death of the last duke, Charles the Bold, it passed to the house of Austria by the marriage of his daughter Mary with the archduke Maximilian, through whose son Philip it became attached to the crown of Spain. Louis XIV. conquered it in 1674, during his war against Holland, and got definite possession of it by the treaty of Nimeguen in 1678.

FRANCHI, Amosio, an Italian philosopher, whose real name is **FRANCESCO BONAVINO**, born at Pegli, in the province of Genoa, in 1820. Having adopted rationalistic views, he left in 1849 the priesthood and an institution over which he presided at Genoa, and in 1852 published *La filosofia delle scuole italiane*, in opposition to the doctrines of Rosmini, Gioberti, and Mamiani, and in favor of the French philosophers of the 18th century. His treatise *La religione del secolo XIX.* (1853), his review, *La Ragione*, established in 1854, and *Il razionalismo del popolo* (1855), indicate his adherence to Feuerbach, Comte, and other positivists, and expound humanitarian and rationalistic views of religion and civilization; and in his *Del sentimento* (1854) he makes sensation the basis of all psychological faculties. Among his more recent publications are *Lezioni sulla storia della filosofia moderna* (1863), and *Sulla teoria del giudizio* (1871). He has been for some time professor of the philosophy of history in the university of Pavia.

FRANCIA, Francesco, a painter of the Bolognese school, whose real name was **FRANCESCO RAIBOLINI**, born in Bologna about 1450, died in 1517, or, according to Lanzi, in 1538. He

was originally a goldsmith, and acquired great skill in his profession, under the direction of a master named Francia, whose name he took. In 1490 Giovanni Bentivoglio invited the artists of neighboring cities to adorn his palace in Bologna. Francia, zealous to uphold the honor of Bolognese art, competed with the strangers, and painted some noble works for the Bentivoglio chapel, one of which, an altarpiece with portraits of the Bentivogli, is probably as fine a specimen of his style as exists. Later in life Francia attempted fresco painting, of his proficiency in which he has left a notable example in the series illustrating the life of St. Cecilia, now in decay. His style partakes of the characteristics of Perugino and G. Bellini.

FRANCIA, José Gaspar Rodríguez (commonly called Dr. Francia), dictator of Paraguay, born in Asuncion about 1757, died there, Sept. 20, 1840. He boasted that he was of French extraction, but his father is supposed to have been born in Brazil, of Portuguese descent, and to have emigrated to Paraguay as an agriculturist along with other settlers. His mother was a creole. He was educated for the priesthood, received the degree of doctor of divinity, was for a short time a professor of theology at Cordova de Tucuman, then applied himself to the practice of the law, and gaining a reputation for ability and rectitude, was appointed to several public offices. After the declaration of independence by the Paraguayans in 1811, he became the secretary of the revolutionary junta, the other members of which were two assessors and a president, Don Fulgencio Yegros. The latter and Francia were in 1818 appointed joint consuls for one year, but Francia was the moving spirit of the government. At his instigation the consulship was abolished in 1814, and he was made dictator for three years, at the end of which he contrived to secure his election as dictator for life. He combined in his own person almost all the powers of the government. He monopolized the cultivation of *mate* or Paraguay tea, and of other products of the country, but husbanded the national resources with great sagacity, gave a powerful impulse to the rearing of horses and cattle and to the cultivation of rice and grain, and established a standing army and guard houses along the frontiers, to protect the people against attacks from the Indians. He devised a code of laws, promoted education, checked the abuses of the clergy, improved the appearance of the capital, and, while neighboring states were in anarchy, secured for Paraguay a comparative degree of tranquillity. He peremptorily declined all intercourse with other South American states, and almost all foreign nations, and detained all foreigners who set foot in the country. No export or import trade was allowed without the dictator's license, and death awaited those who were detected in leaving the country without his special permission. Those opposed to his rule were either shot or imprisoned. The principal victims of his administration were pecu-

lating officials, corrupt priests, and persons generally who endeavored to enrich themselves at the public expense. He was generally humane toward the poor, and professed to be impelled to rigorous measures by a sense of justice. He was most unrelentingly cruel toward those who were accused of conspiracy against his life. About 1819 Gen. Ramirez of Entre Rios was supposed to contemplate an invasion of Paraguay. A letter from him to Yegros, Francia's former associate in the consulate, fell into the latter's hands. Yegros was charged with plotting against the country, and, with upward of 40 others, was put to death, and about 800 persons were imprisoned for 18 months, when they were only released upon the payment of a large ransom. Some of Francia's prisoners were subjected to the most cruel tortures, and the delight which he seemed to find in inflicting torment gave rise to the belief that, like some of his brothers, he was occasionally deranged. In his habits of life he was peculiar. After having been fond of gambling and social and sensual enjoyments, he led a life of the utmost retirement, and Paraguay was not more isolated from the rest of the world than he from the rest of mankind. He resided in the palace of the former governors of Paraguay, attended by four slaves. His barber, a mulatto, was his principal channel of communication with the public, and a half-breed named Patiños was his principal secretary. After the death of his master the latter was implicated in a charge of conspiracy against the government, and hung himself in prison. Toward the end of his reign Francia was in constant fear of assassination. He remained a bachelor until his 70th year, when he was reported to have married a young French woman. He was a man of remarkable physiognomy, with dark, piercing eyes, and of great mental powers, which he cultivated by study and reading. He was especially fond of the French literature of the 18th century, and an admirer both of Robespierre and Napoleon. The anecdotes of his eccentricities were almost as numerous as the reports of his cruelties. Yet his death was deplored as a public calamity, and the people seemed to recognize in him a friend and a benefactor. His reputation as the tyrant of Paraguay was particularly aggravated in Europe by his treatment of Bonpland the distinguished botanist, whom he detained for nearly ten years, and by the accounts given of him by other persons whom he had interfered with. Among these were two Swiss surgeons, Renger and Longchamp whom he detained from 1819 to 1825. On their return they related their observations, and expressed their dislike of Francia, in an *Essai historique sur la révolution de Paraguay et le gouvernement dictatorial du docteur Francia* (Paris, 1827). Two young Scotchmen, J. P. and W. P. Robertson, who went to Paraguay on a commercial venture, were turned out of the country by the dictator, and they gave appalling accounts of his

administration in three works: "Letters on Paraguay" (2 vols., London, 1838), "Francia's Reign of Terror" (1839), and "Letters on South America" (3 vols., 1843). A graphic sketch of his life and character was given by Thomas Carlyle in an article in the "Foreign Quarterly Review" (1848), in which the dictator is greatly lauded for his eccentric and ruthless energy and justice. C. A. Washburn, in his "History of Paraguay" (1871), paints him in the darkest colors.

FRANCIS, the name of several sovereigns of France, Germany (including Austria), and the Two Sicilies.

I. FRANCE.

FRANCIS I., king of France, son of Charles, count of Angoulême (cousin german of Louis XII.), and Louisa of Savoy, born at Cognac, Sept. 12, 1494, died at Rambouillet, March 31, 1547. He married Claude, daughter of Louis XII., in 1514, and succeeded him as nearest heir, Jan. 1, 1515. Louis was meditating the reconquest of the Milanese, which he claimed as heir of his grandmother, Valentina Visconti, at the moment of his death; and the youthful king, having renewed his predecessor's treaty with England, immediately crossed the Alps with an army of about 40,000, by passes previously considered impracticable. The Swiss army employed by the duke of Milan to defend the foot of the Alps was driven back, but being joined by reinforcements gave him battle at Marignano (Melegnano), 10 m. S. E. of Milan, Sept. 13, 1515. It was a fierce contest, since called the battle of the giants; and though the Swiss had only infantry to oppose to the finest cavalry in Europe, they retired only on the second day with a loss of 12,000. Francis had lost 8,000 of his best troops, but he had displayed extraordinary generalship and valor; and his name became at once the most distinguished in Europe. In the chivalric spirit of the age he accepted knighthood on the spot from the chevalier Bayard, whose final charge had completed the victory. After the battle Francis wisely granted the Swiss an honorable peace, and secured their constant alliance. He also made a concordat with the pope, and, master of Milan, returned in triumph to Paris. In 1517 he made a treaty of friendship and alliance against the Turks with the emperor Maximilian and his grandson Charles I. of Spain, and in 1518 a treaty with England, by which Tournay was returned to France. He was now established firmly at home; the power of the feudal nobility was gone, and his parliament was wholly subservient. Maximilian died in January, 1519, and Francis became a competitor with Charles I., afterward Charles V. of Germany, for the imperial sceptre. Charles prevailed in the electoral council in consequence of a recommendation of Frederick the Wise, elector of Saxony, and Francis betrayed the passions natural to disappointed ambition. His chagrin forced from him expressions of dispar-

agement of his successful rival, which were resented; and from this jealousy, as much as from conflicting interests, arose that hostility between these princes which kept Europe in turmoil during their reigns. It was easy to find causes of strife; Italy and Navarre afforded them abundantly. But before engaging in war, each strove to gain to his interests the English king Henry VIII., who obviously held the balance in his hand. Charles hastened to pay this monarch a personal visit at Dover as he passed from Spain to his dominions in the Netherlands, and at the same time secured the influence of Cardinal Wolsey by a virtual promise of the papacy. Francis invited Henry to France, where, by a splendid hospitality, he hoped to gain both the cardinal and his master. The sumptuous interview took place in the plain between Guines and Ardres, which history commemorates as the field of the cloth of gold (June 4-24, 1520). Unprecedented magnificence, feats of chivalry, and gallant exercises of every description, occupied the two courts. The kings themselves, according to Fleuranges, had a personal wrestling match in private. Francis easily overthrew his antagonist, but by his frank and generous bearing won his friendship. Henry, however, flattered by Charles, whose visit he returned after his conference with Francis, was easily secured to the interest of the emperor, and declared that he wished to remain impartial, but should pronounce against the aggressor. The French king began hostilities by seizing Navarre. His troops also invaded Spain, but were routed and chased beyond Navarre. Charles attempted to enter France from the north. He was repelled at Mézières by the chevalier Bayard, and Francis marched into the Netherlands. By some strange over-cautiousness he lost an opportunity of cutting off the whole imperial army. Meanwhile Cardinal Wolsey effected a league between his sovereign, the emperor, and the pope, against Francis. A papal army, under Prosper Colonna, seized Milan, and dispossessed the French of all their Italian conquests except the fortress of Cremona. Francis, in the midst of these disasters, received from Henry of England a declaration of war (May 29, 1522). Undaunted, however, although his treasury was utterly exhausted, he succeeded in putting the kingdom in a state of defence. The constable de Bourbon at this crisis, rejecting the queen mother's invitation to marriage, and robbed by the incensed woman through legal chicanery of his family estate, not only offered his sword to the emperor, but proposed to incite a rebellion in France. The conspiracy was discovered, and Bourbon fled; but an invasion of English and imperialists, which advanced to within 11 leagues of Paris, compelled Francis to abandon his plan of carrying the war into Italy. He nevertheless despatched an army of 80,000 men against Milan, which failed through the incapacity of Bonnivet, its commander. Bourbon principally conducted

the imperial operations in this quarter, and in conjunction with Pescara (1524) drove the French, after a rout at Biagrasso, into their own country. In this defeat the chevalier Bayard, who commanded the vanguard, was killed. The imperialists entered Provence. Francis hastened in person to relieve Marseilles, carried all before him, pursued the enemy again into Piedmont, and laid siege to Pavia. He was here defeated in a great battle, Feb. 24, 1525. His Swiss allies fled; and Francis, unhorsed, after killing with his own hand seven of the enemy, at length yielded his sword to the Neapolitan viceroy Lannoy, and was hurried a prisoner to Madrid. Europe was filled with alarm. The emperor's unworthy behavior to his gallant captive, together with his growing power and ambition, roused the animosity of Henry of England, who now declared for France, and demanded the liberation of the king, as did also Rome, Venice, Florence, and Genoa. But the emperor insisted on large cessions of territory, the restoration of the constable de Bourbon to all his rights, the marriage of Francis with Charles's sister Eleanor, queen dowager of Portugal, and the delivery of his two eldest sons as hostages for his good faith. Francis at last signed a treaty on these conditions, but at the same time caused a secret protest against them to be drawn up, and was liberated March 17, 1526, his sons taking his place at Madrid. He at once demanded and obtained from the pope absolution from his oath to fulfil the treaty, and, gracefully thanking the English king for his sympathy and alliance, sent forth armies again to Italy. If, say French historians, he was guilty of perjury, then was every man in France his accomplice. Charles, overreached, and now opposed by all Italy as well as France and England, sent Bourbon with an army of mercenaries against the pope. Rome was sacked, and the pope was imprisoned. A French army under Lautrec hastened to avenge the insulted pontiff, but after a series of triumphs was destroyed by disease before Naples. Meanwhile Francis challenged Charles V. to a duel; the emperor accepted; but the year 1528 was consumed in their mutual charges and recriminations. Both sovereigns were exhausted of men and money, and peace, an obvious necessity for all the belligerents, was concluded at Cambrai by the mother of Francis and the aunt of Charles (Margaret of Austria) in August, 1529. The king of France retained Burgundy, surrendered his Italian claims, and promised 2,000,000 crowns ransom for his sons. Francis at the same time married Queen Eleanor. This treaty secured to France a few years of peace, during which Francis encouraged letters and art, and, after wavering for a time between the influence of Louise of Savoy and Margaret of Navarre, decided against the reformation, and persecuted the reformers with great rigor. On July 16, 1535, however, he issued an edict of toleration. This change had a political cause. In

1533 the duke of Milan put to death an agent of the king of France, charged with murder. Seizing this as a pretext for war, Francis took up arms again, and in 1535 overran Savoy. Charles in the spring of 1536 marched upon Provence, and the French troops hurried again to the defence of that region. Charles lost half his army through famine and disease, the country having been laid waste purposely by the French commander, and with the remainder fled before the light troops of the province. At the same time the prince of Nassau, who had invaded the north of France, was compelled to retreat. Soon after these events, the eldest son of Francis died, poisoned, as was supposed. The crime was laid to the charge of the emperor, probably without any foundation; but the circumstance carried the exasperation of the two sovereigns to the extreme of decency. Francis attacked the Netherlands, and even formed an offensive alliance with the Turkish sultan Solymán; but the pope and the queen of Hungary interposing with offers of mediation, a truce of ten years was concluded at Nice (1538). The rivals exchanged visits and embraced; and Charles promised to invest a son of the French king with the sovereignty of Milan, but the promise was never fulfilled, Charles giving the duchy instead to his son Philip. War again broke out in 1542, and Francis sent five armies against various quarters of the imperial dominions, and gained a great battle at Ceresole (April 14, 1544), but without important consequences. After a short invasion of France by Henry VIII. and Charles in alliance, peace was concluded with the emperor at Crespy, Sept. 18, 1544. The war with England continued, but without remarkable actions, until June 7, 1546. This treaty, like that of Nice, was followed by renewed persecution of the reformers. Having no more need to maintain his Protestant alliances, Francis carried out a most cruel decree against the Vaudois, desolating the country and killing the inhabitants by thousands. The king's health had been hopelessly ruined some years before in consequence of one of his many amours, and death at length ensued. Francis was an unhesitating libertine, though during the latter years of his life his attention was given to wiser thoughts; but notwithstanding his vices and his cruelty to the Protestants, admiration cannot be withheld from many gallant and noble traits of character, which might have been blessings to his country had he been content with any other than military glory. His challenge to Charles V., and his court rules of honor and chivalry, did much to establish the practice of duelling. Yet he introduced into France many improvements of art and learning. Of his munificence many monuments remain; as the national library of Paris, the original Louvre, Fontainebleau, and Chambord. By his first wife he had seven children; by the second none. To his son Henry II. he bequeathed a treasury with a surplus of 400,000 crowns.

FRANCIS II., king of France, born in Fontainebleau, Jan. 19, 1543, died in Orleans, Dec. 5, 1560. He was the eldest son of Henry II. and Catharine de' Medici. His father had succeeded in obtaining some important advantages over the emperor Charles V. and the house of Spain, and in terminating favorably a long series of wars, chiefly in Italy and the Netherlands, against the growing might of that house. Henry died in 1559 of a wound accidentally received in a tournament. Francis, then a sickly boy of 16 years, possessed of neither character nor talent, succeeded to the throne. He had already (in April, 1558) married the daughter of James V. of Scotland, the beautiful and afterward unhappy Mary Stuart. Her influence gave the reins of government to her uncles, Francis, duke of Guise, and the cardinal of Lorraine. The arrogant sway of these two ambitious and unscrupulous princes alarmed and irritated the princes of the blood, Anthony, king of Navarre and his brother Louis of Condé, who became the leaders of a Protestant party in opposition to the court. Everything concurred to produce civil commotion. Protestantism had penetrated, in the form of Calvinism, into France. Its spirit suited that of the feudal nobility, and the profligacy and corruption introduced by the Italian Medicis into the court and manners of France, and the influence of strangers, disposed the people to rebellion. It was by secret plots, however, rather than by open revolt, that the Protestant princes tried to wrest power from the hands of the Guises. A great conspiracy was organized, having Condé at its head, and embracing the most prominent nobles of France. It was agreed to enter Amboise on a certain day in detached parties, to massacre the Guises, and seize the person of the king. But the plot was disclosed almost at the moment of execution, by two Protestants; the duke of Guise secretly assembled a body of troops, and cut to pieces the forces of the conspirators as they were entering the town. His triumph was stained with barbarous cruelty, and the waters of the Loire were colored with the blood of those who fell in combat or perished on the scaffold. The court gazed at the executions, as scenes of public festivity, from platforms and the windows of the castle. Arrests and executions throughout the country followed. The duke of Guise was made lieutenant general of the kingdom. The axe was brought into play to stifle the opposition of the princes, and the inquisition was set up to repress Calvinism. A royal edict made the bishops, instead of the parliaments, judges of heresy. The Huguenots, seeing in this edict their speedy destruction, prepared to resist, and the court convoked at Fontainebleau an assembly, with the purpose of seizing the two princes of Bourbon; but they came with an escort strong enough to protect them. The princes of Lorraine convened the states general at Orleans. Condé had tried to dissemble his mortification at the failure

of Amboise, and was now imprudent enough to appear. He was arrested, tried, and soon condemned to die as a traitor. The death of Francis, however, saved his life, and restored him to the leadership of the Huguenots. The young king had long suffered from an abscess in his ear, and died after a reign of 17 months, so suddenly that rumors of poison, now regarded as unfounded, spread, and were believed throughout the country; the more easily, as assassination was becoming fashionable in France, and the queen mother was renowned for her love of alchemy and the use of poisons. Francis bequeathed to his brother and successor, Charles IX., then a boy of ten years, a treasury loaded with debt, and a state full of the elements of civil war. The regency was intrusted to Catharine de' Medici, whose intrigues fostered civil and religious dissensions.

II. GERMANY AND AUSTRIA.

FRANCIS I. (STEPHEN), emperor of Germany, born Dec. 8, 1708, died at Innsbruck, Aug. 18, 1765. He was the son of Leopold, duke of Lorraine, and of a niece of Louis XIV., and was the great-grandson of the emperor Ferdinand III. In 1729 he succeeded his father, but in consequence of the war of the Polish succession, his duchy was given in 1735 to the ex-king Stanislas, father-in-law of Louis XV., to revert after his death to France, and he received the reversion of the duchy of Tuscany, where the house of Medici was about becoming extinct. Francis in 1736 married Maria Theresa, daughter and heiress of the emperor Charles VI. Charles appointed him generalissimo, and he subsequently fought in a successful campaign against the Turks. After the death of the last of the Medicis in 1737, Francis went with Maria to Florence, the capital of his new dominion. The emperor dying in 1740, he returned to share with his wife the regency of the Austrian dominions, though without any real power in the administration, and fought for her rights in the wars which ensued. Francis was elected emperor of Germany in 1745, and acknowledged by Bavaria and Prussia in the same year, but not by France and Spain until the peace of Aix-la-Chapelle in 1748. Being of a mild and peaceful disposition, and influenced more by avarice than by ambition, he promoted commerce and agriculture, particularly in Tuscany, but left the heavier cares of government to his wife, who in 1756 became involved in the seven years' war with Prussia. Two years after the termination of this war Francis died, leaving the German crown to his son Joseph II., for whom, however, his mother reigned till 1780, and Tuscany to his younger son, afterward Leopold II.

FRANCIS II., emperor of Germany (I. of Austria), born in Florence, Feb. 12, 1768, died in Vienna, March 2, 1835. He was the son of the emperor Leopold II. and of Maria Louisa, daughter of Charles III., king of Spain. He

was educated first at the polished and popular court of Florence, then at that of Vienna. He accompanied his uncle Joseph II. in his campaign against the Turks in 1788, and in 1789 received the title of commander-in-chief of the army, though still a youth of 21 years, the old and experienced general Laudon being his assistant and adviser. After the death of Joseph (1790), Francis held the reins of the empire for a few days, till the arrival of his father from Florence, whom he followed in the next year to the convention of Pilnitz, where the emperor and the king of Prussia formed the first coalition against revolutionary France. Leopold died in 1792, and Francis was successively crowned king of Hungary, emperor of Germany, and king of Bohemia. He was soon surrounded with difficulties and dangers. Hungary was in a state of national excitement, and the Belgian provinces were ripe for revolt. The legislative assembly of France obliged Louis XVI. to declare war against him in April, 1792. The victories of Dumouriez and the revolt of Belgium, the victories of Custine on the Rhine, the execution of Louis XVI., and that of Marie Antoinette, the aunt of Francis, rapidly followed. It was in vain that Clerfayt obtained some advantages over the French, and that Francis took the command of the army in person. The armies of the republic soon drove back the allies; Francis's confederates deserted him, and in 1795 Tuscany, Sweden, Spain, and Prussia concluded at Basel a treaty of peace with the republic, whose Italian army, now commanded by Bonaparte, conquered in the next two years the whole north of Italy. Francis himself, notwithstanding some slight advantages gained by his brother the archduke Charles over Moreau, in southern Germany, was finally forced to conclude the treaty of Campo Formio (Oct. 17, 1797), in which he sacrificed Belgium, Milan, and a Rhenish province of the empire, in exchange for Venice. Changes in France and new French aggressions tempted Austria, Russia, and England to another war in 1799. The allied armies were successful for a while under the archduke Charles in Germany, under Hotze in Switzerland, and under Kray and Suvaroff in Italy. But reverses came; Suvaroff was recalled by his emperor, and Bonaparte became master of France by a *coup d'état*, and of Italy by the passage of the Alps and the battle of Marengo (June 14, 1800), while Moreau fought his way through southern Germany toward Vienna. These disasters compelled Francis to the peace of Lunéville in 1801, by which he lost a portion of Germany and acquired a portion of Italy. England made peace with France at Amiens, but broke it again, and framed a new coalition, in which the emperors Francis and Alexander and the king of Sweden took part, while Prussia remained neutral, and Bavaria, Württemberg, and Baden were ready to side with the French. Francis expected the first attack from Italy,

and sent thither his brother Charles, who gained a battle over Masséna; but Napoleon broke through Germany, and his sudden marches, the surrender of Ulm with its 24,000 men under Mack, the retreat of the archduke Ferdinand, and the great battle of Austerlitz (Dec. 2, 1805), in which the two allied emperors were present, made him the dictator of the treaty concluded at Presburg, Dec. 26, in which Francis lost the Tyrol, Venice, and 3,000,000 subjects, and received only Salzburg. The electors of Bavaria and Würtemberg now took the title of kings as a reward for their support of the victor. Francis was compelled to remain neutral in the fourth coalition, and to acknowledge the confederation of the Rhine founded under Napoleon's protectorate. The French ambassadors declared that they no longer recognized a German empire or a German constitution; and Francis, who had in 1804 assumed the title of hereditary emperor of Austria, solemnly laid down that of emperor of Germany in August, 1806. The peace of Tilsit and the alliance of Napoleon and Alexander threatened Austria with destruction and drove Francis to the most energetic measures. He armed the ancient German militia, and summoned the Hungarian nobles to a general rising in their old fashion. Three brothers of the emperor were sent with armies across the German, Italian, and Polish frontiers; but Austria stood this time alone, while Napoleon was assisted by Poles, Russians, and Germans. With the exception of the battle of Aspern and Essling, May 21 and 22, 1809, in which Napoleon suffered his first check, the whole campaign in Germany was a series of French victories. The Austrians were forced to evacuate Vienna, driven from Poland, and signally defeated at Wagram; the Hungarian nobles were dispersed, and a rising of the Tyrolese in favor of Austria proved abortive. The peace of Schönbrunn (Oct. 14) cost Francis some rich provinces and more than 3,500,000 subjects. The resources of his empire were exhausted, and his treasury had long been bankrupt. In this situation he consented to give his daughter Maria Louisa in marriage to Napoleon, and soon saw the title of king of Rome, once his own, bestowed upon her child. In the disastrous Russian campaign of 1812 an auxiliary Austrian force occupied Poland in the French interest, but effected little. In 1813 Francis declared his neutrality, negotiated secretly with Great Britain and Russia, took part in the congress of Prague, and on Napoleon's refusal to accept his mediation with Russia joined the allies, and contributed largely to their victory at Leipsic. In the following year he entered France with his army, and remained two months in Paris after its occupation by the allies, March 31. In June the European congress assembled at Vienna, but the brilliant festivals with which Francis entertained his guests were interrupted in March, 1815, by the news of Napoleon's return from

Elba. An Austrian army now crossed the Simplon and occupied Lyons, while another marched into Italy, overthrew Murat, and restored to the old king Ferdinand the crown of Naples. On the restoration of peace after the battle of Waterloo, Francis, having ceded Belgium to the Netherlands, and acquired Lombardy and Venice, saw his empire greater than it had ever been before. He became a party to the "Holy Alliance" in 1816, and his policy, developed by Metternich, became the policy of Europe. Based on a horror of revolution and a reverence for hereditary right, it took the form of a thorough conservatism and centralization, supported by a large standing army, a secret police, strict subordination, a literary censorship, and other measures of repression. Austria was the centre of all the reactionary movements of the period following the French restoration. Monarchical congresses for the suppression of the revolutionary spirit of Germany, Spain, and Italy were held on its territory at Carlsbad in 1819, at Troppau in 1820, at Laybach in 1821, and at Verona in 1822; Austrian armies arrested a revolutionary movement in Piedmont and annulled the constitution of Naples, and Austrian influence prevailed in Spain, Portugal, and the German confederacy at Frankfort. Francis sanctioned even the despotic rule of Turkey over Greece, and imprisoned the Greek refugee Ypsilanti. He was the first to counteract in Italy the influence of the French revolution of July, 1830, crushing the feeble revolutionary attempts of 1831, and was of aid to Czar Nicholas in repressing the Polish struggle for independence. It was nevertheless a constant though secret part of his policy to check the growing and threatening power of Russia. At home his chief embarrassments sprang from an exhausted treasury, enormous debts, and the uneasiness of the Italians, Hungarians, and Slavs. New loans and taxes relieved his finances; state prisons and rigorous punishments were used to crush the spirit of independence in Italy; while the diet of Presburg was appeased by reluctant concessions, and German officials kept order in Galicia and Bohemia. In the promotion of industry, commerce, and the arts in the German provinces, and the advancement of German influence, he showed a wiser policy. The courts of law were reorganized, and the ancient codes were revised and modified. Francis was economical, industrious, and correct in his personal habits, popular with the Germans, but little known and less liked by his other subjects. The antipathies inspired by the reactionary measures of his government, and the attacks of the liberal press in foreign countries (for there was none in Austria), and of the Hungarian patriots in their diets and county assemblies, were directed less against the emperor than against his minister Metternich. His private treasury was in an incomparably better condition than that of the state, and his family was large and prosperous. The lat-

ter part of his reign was undisturbed. Of his four wives, princesses of Wurtemberg, Sicily, Modena, and Bavaria, the second, Maria Theresa, was the mother of 13 children, among whom were Maria Louisa, wife of Napoleon I., Ferdinand, who succeeded to the throne, and Francis Charles, father of Francis Joseph.

FRANCIS JOSEPH, emperor of Austria, grandson of the preceding, eldest son of the archduke Francis Charles, and nephew of the emperor Ferdinand I., born Aug. 18, 1830. He was educated under the care of Count Bombelles, and was early inspired with ambition by his mother, the archduchess Sophia (died May 28, 1872), daughter of the king of Bavaria and sister of the queens of Prussia and Saxony, who possessed more influence and enterprise than either the emperor or her husband, the heir presumptive to the throne. Like his uncle Ferdinand, Francis Joseph was taught to speak the various languages of his polyglot empire, and also became a skilful rider, and fond of military displays. Sent to Pesth in 1847 to install his cousin Stephen as palatine of Hungary, he spoke Hungarian to the assembled nobles, and gained some popularity. The revolutions of 1848 brought the Austrian empire to the brink of dissolution. It seemed that the accession of a prince who had no unpopular record was a necessity, and the archduchess, who was the leading spirit of the counter-revolutionists, contrived that Francis Joseph, though only 18 years old, should be declared of age, Dec. 1, 1848; and on the following day his father resigned his right to the succession, and his uncle the emperor abdicated, in favor of the young prince. For the political and military events of the reign of Francis Joseph down to the close of 1872, see *AUSTRIA* (vol. ii., pp. 146-153). In November, 1869, Francis Joseph assisted at the formal inauguration of the Suez canal. On April 8, 1878, the emperor gave his sanction to a new electoral reform bill for Cisleithan Austria, of which the leading features are: The members of the lower house henceforth to be elected by all persons entitled to the suffrage; the number of members of the lower house to be increased to 120; each electoral district will elect one deputy; every one entitled to vote for a member of a provincial diet will also be entitled to vote for a member of the Reichsrath; the votes to be given in writing; an absolute majority will be necessary for the election of a candidate; those entitled to vote in any one province to be eligible in all the provinces; the period for which a member is elected is six years. Francis Joseph was married, April 24, 1854, to a daughter of Maximilian, duke of Bavaria. The heir apparent of the Austro-Hungarian crown is his son, the archduke Rudolph Francis Charles Joseph, born Aug. 21, 1858.

III. TWO SICILIES.

FRANCIS I., king of the Two Sicilies, born in Naples, Aug. 19, 1777, died there, Nov. 8,

1830. He was the son of Ferdinand I. and Caroline Maria. The death of his elder brother in 1778 made him heir to the throne, and he married a daughter of the emperor Leopold II., who became the mother of the future duchess of Berry. After the death of his wife in 1801 he contracted a second marriage with the daughter of Charles IV. of Spain. His father appointed him regent of Naples in 1812, and on the advice of Lord Bentinck he proclaimed a constitutional form of government; but in November, 1813, Ferdinand dissolved the parliament and deposed his son. In 1815 Francis returned to Naples, and succeeded in making himself so popular that his father was obliged to appoint him governor of Sicily under the title of duke of Calabria; and on the outbreak of the revolution in 1820 he was obliged to reinstate him as regent at Naples. Francis, siding with the revolutionists, restored constitutional institutions; but subsequently, being informed of the projected Austrian intervention in favor of absolutism, he reconciled himself with his father, on whose death, Jan. 4, 1825, he succeeded to the throne. Contrary to his antecedents, his short reign became notorious for subserviency to Austria, mismanagement, corruption, and cruelty, and especially for the wholesale massacre of the revolted inhabitants of Bosco and the utter destruction of that little town. His second wife bore him seven daughters, one of whom, Maria Christina, became the wife of Ferdinand VII. of Spain and the mother of Queen Isabella, and five sons, the eldest of whom was his successor, Ferdinand II.

FRANCIS II., son of Ferdinand II. and of the princess Christina of Savoy, born Jan. 16, 1836. His mother died two weeks after his birth, and his father, contracting a second marriage with the archduchess Maria Theresa, paid greater attention to his children by the latter wife than to Francis, whose education was conducted by Jesuits. Soon after his marriage with a Bavarian princess, sister of the present empress of Austria, he succeeded to the throne, May 22, 1859. Rejecting the request of Victor Emanuel to join him against Austria, he adhered to the system of his father, and marked his accession by arresting thousands of his subjects and banishing others. After the landing of Garibaldi at Marsala in May, 1860, and the capitulation of all Sicily excepting Messina, he endeavored in vain to obtain the intervention of foreign powers in his favor, especially of Napoleon III. He likewise failed to conciliate his subjects by a restoration of constitutional government (June 25), and by granting an amnesty. He was obliged to leave Naples on the eve of Garibaldi's entrance into the city, and retired to Capua, whence he sallied forth (Oct. 1) with a rather numerous army, but was routed by the Garibaldians, and after the arrival of the Sardinian army Capua was compelled to surrender (Nov. 2) with about 11,000 troops. He next shut

himself up with his remaining forces in the citadel of Gaëta, which after a siege of a few weeks surrendered to Cialdini, Feb. 13, 1861, and Francis took refuge on a French frigate, landing at Cività Vecchia. His dominions were merged in the kingdom of Italy, and he afterward lived chiefly at Rome till it became the capital of that kingdom.

FRANCIS, Convers, an American clergyman and author, born at West Cambridge, Mass., Nov. 9, 1795, died at Cambridge, April 7, 1863. He graduated at Harvard college in 1815, and after completing his studies at the divinity school became in 1819 minister of the Unitarian church at Watertown, Mass. In 1842 he was appointed Parkman professor of pulpit eloquence and the pastoral care in Harvard university. He published a number of discourses and lectures, and wrote the lives of John Eliot and Sebastian Råle for "Sparks's American Biography," and memoirs of Dr. John Allyn, Dr. Gamaliel Bradford, and Judge John Davis for the "Massachusetts Historical Collections."

FRANCIS, John Wakefield, an American physician and author, born in New York, Nov. 17, 1789, died there, Feb. 8, 1861. His father was a German, and his mother of Swiss descent. In his youth he was employed as a printer. Subsequently he entered an advanced class at Columbia college, and graduated A. B. in 1809, and M. D. at the college of physicians and surgeons in 1811, this being the first degree conferred by the latter institution. He was a partner of Dr. Hosack, with whom he had studied medicine, until 1820. In 1818 he was appointed lecturer on the institutes of medicine and materia medica at the college of physicians and surgeons, and soon afterward, the medical faculty of Columbia college having been consolidated with that institution, he received the chair of materia medica in the united body. He would accept no fees for his first course, fearing lest some might be excluded from the lectures by the expense. In 1816 he went to Europe, and completed his studies under Abernethy. On his return to New York he was appointed professor of the institutes of medicine, and in 1817 of medical jurisprudence. From 1819 he was professor of obstetrics, in addition to his other duties, until 1828, when the whole faculty resigned, and a majority of them founded the Rutgers medical school, Dr. Francis filling the chair of obstetrics and forensic medicine four years, until the institution was closed by the legislature. Subsequently he devoted himself to practice and the pursuit of literature. In 1810, while yet a student, he prepared with Dr. Hosack the prospectus of the "American Medical and Philosophical Register." In 1822-'4 he was one of the editors of the "New York Medical and Physical Journal." He actively promoted the objects of the New York historical society, the woman's hospital, the state inebriate

asylum, the cause of natural history, the typographical guild, and the fine arts. He was the author of biographical sketches of many distinguished men of his time, and articles in medical periodicals, and published "The Use of Mercury" (1811), "Cases of Morbid Anatomy" (1814), "Febrile Contagion" (1816), "Notice of Thomas Eddy the Philanthropist" (1823), "Denman's Practice of Midwifery" (1825), "Letter on Cholera Asphyxia" (1832), "The Anatomy of Drunkenness" (1841), "A Memoir of Christopher Colles" (1855), and "Old New York, or Reminiscences of the past Sixty Years" (1857; republished, with a memoir of the author, by H. T. Tuckerman, 1865). He was the first president of the New York academy of medicine in 1847.

FRANCIS, Joseph. See supplement.

FRANCIS, Sir Philip, a British politician and pamphleteer, born in Dublin, Oct. 22, 1740, died in London, Dec. 22, 1818. He was the son of the Rev. Philip Francis, author of an elegant and popular translation of Horace, and also of several tragedies and some liberal political pamphlets. The son removed with his father to England in 1760, and was placed on the foundation of St. Paul's school, where he remained about three years. Here Woodfall, afterward the printer of the "Public Advertiser" and publisher of the "Letters of Junius," was his fellow pupil. In 1756 he was appointed to a place in the office of his father's patron, Henry Fox, then secretary of state, which he continued to retain under the secretaryship of Mr. Pitt. In 1758 he went as private secretary to Gen. Bligh in an expedition against the French coast, and was present in a battle near Cherbourg. In 1760 he was secretary to the earl of Kinnoul, ambassador to Portugal, and on his return to England in 1768 received an appointment in the war office. Here he remained till March, 1772, when he resigned in consequence of a quarrel with Lord Barrington, the new secretary at war. The remainder of that year he passed in travelling through Flanders, Germany, Italy, and France. In June, 1773, soon after his return, he was appointed one of the council of Bengal with a salary of £10,000. He went to India in the summer of 1774, and remained there till December, 1780, when he resigned on account of a quarrel with Warren Hastings. This quarrel led to a duel, in which Francis was shot through the body. His active and somewhat austere disposition had brought him into constant opposition to Hastings, and for a time he controlled the majority in the council. Two of the members having died, Hastings obtained the mastery; and after their duel Francis returned to England in disappointment and anger. To revenge himself upon Hastings seems to have been the ruling motive of his later life. In 1784 he became member of parliament for Yarmouth in the isle of Wight. He was a bold, severe, and frequent speaker, but he never became distinguished as an orator. His

politics were always extremely liberal. When the prosecution of Hastings began in 1786, its leaders would have committed the management to Francis. The house of commons, however, because of his personal quarrel with Hastings, refused twice, by large majorities, to permit this appointment, and Burke, Fox, and Windham labored in vain to change this determination. Francis, however, consented to a written request of the committee of managers inviting him to aid them in their labors, and passed many years in this occupation. When others tired, he never flagged. He embittered the existence of his enemy, and no doubt destroyed his own peace in the effort. Hastings, however, finally triumphed and was acquitted. When the French revolution broke out, Francis was its firm friend, and became an active member of the revolutionary association of "Friends of the People." He was defeated at the election of 1796, when he stood for Tewkesbury, but in 1802 was returned by Lord Thanet for the borough of Appleby, and continued to sit for that borough while he remained in parliament. He sustained Fox and Grey in their plans of reform, and advocated the abolition of the slave trade with unflinching ardor. In October, 1806, on the formation of the Grenville ministry, Francis was made a knight of the bath. It is believed that it was also designed to send him to India as governor general, but this appointment never took place. He retired from parliament in 1807, and afterward wrote pamphlets and political articles in the newspapers. From the obscurity of old age he was suddenly recalled to the attention of the public. In 1816 John Taylor published his "Junius identified with a Distinguished Living Character," viz., Sir Philip Francis. The argument is ingenious, the coincidences are remarkable, and his authorship has since been maintained by several other writers; but none of Francis's acknowledged writings equal the fierce eloquence of Junius. The representations of what Francis himself said on the subject are contradictory. (See JUVIUS.) He was the author of about 26 political pamphlets.

FRANCIS OF ASSISI, a saint of the Roman Catholic church, and founder of the order of Franciscans, born in Assisi in 1182, died near that city, Oct. 4, 1226. His father was Pietro Bernardone, a wealthy merchant, and his mother Pica Moriconi. Bernardone was travelling in France when the child was born, and the mother had him baptized under the name of Giovanni. On his return the father added the surname of Francesco, in remembrance of the country where he had made his fortune; and as the boy while growing up spoke French with ease, he was exclusively known as Francesco. He led a gay life until he was captured in a civil conflict of Assisi with Perugia, and kept for a year prisoner in the city of his enemies. During his detention he formed the design of renouncing the world; and fancying that he heard one day while praying in a church

a voice from the crucifix, bidding him repair the falling walls of Christ's house, he gave the proceeds of some goods he had sold to the priest of the church, offering himself as an assistant. This act brought upon him the displeasure of his father, who threatened if he persisted to deprive him of his inheritance. But neither this threat nor the popular ridicule which saluted his seeming insanity could turn him from his purpose. He formally renounced his right of heirship, emptied his pockets, and even stripped himself of his clothing, putting on the cloak of a laborer. He was then (1206) 24 years old. From this time he gave himself exclusively to works of piety and charity. He begged in the streets for money to repair the church, and assisted the masons by carrying the stones with his own hands. He frequented the hospitals, washing the feet and kissing the ulcers of the lepers. Sometimes he was stripped of his coarse raiment by robbers, and sometimes he gave it to the poor whom he met by the way. His exceeding humility in dress and demeanor began after a time to win sympathy for him. Prominent men desired to imitate him, and to become his companions. The rich merchant Bernardo de Quintavalle, in whose house Francis had been a guest, sold all his estate, distributed it to the poor, and came to pray with his friend. To him was soon joined a canon of the cathedral, Pietro di Catana. These brethren received the dress of Francis, a coarse robe of serge girded with a cord, Aug. 16, 1209, from which day the foundation of the Franciscan order properly dates. At the beginning Francis and his companions occupied a little cottage just outside the walls of the city; but as their number increased they removed to the premises of the Portiuncula, which had been offered them by the Benedictines, refusing, however, to accept this as a gift. He slept upon the ground, with a block of wood or stone for his pillow, ate his scanty food cold, with ashes strewed upon it, sewed his garments with packthread to make them coarser, rolled himself in snow to extinguish the fires of sensual desire, obeyed the orders of his novices, fasted long and rigorously, and shed tears so freely that he became nearly blind. He preached wherever he could find hearers, yet he would never take priest's orders, and contented himself with the humble place of a deacon. He abhorred disputes and controversies, held up the spirit of peace as the only Christian spirit, and, amid the fierce and bloody contentions which desolated Italy in the 13th century, made his followers act everywhere as peacemakers. He was a zealous missionary, and made long journeys in behalf of the Catholic faith. His cherished design was to lay down his life in the Holy Land in behalf of Christ's religion. His first attempt to reach Syria proved ineffectual; contrary winds hindered his vessel. But the plan was not relinquished, and after a brief sojourn in Acre, he joined the camp of the crusaders at Damiatta in 1219.

He arrived only to witness the failure of the Christian army, but he was gratified in his desire for an interview with the Saracen chief, and was permitted to testify in presence of the infidels concerning Christ and the Christian faith. On the occasion of the formal approbation of his order in 1223, he preached a sermon before the sacred college, which seems to have been the last of his important public performances. His failing health and growing blindness confined him more and more to that favorite seclusion of the hill of Alverno, on which a nobleman had built a church and convent for the Franciscan brethren. In this solitude he gave himself more ardently to prayer and religious exercises. His enthusiasm became rapture. His visions were multiplied. The Saviour and the saints seemed to appear, and the legend tells of the *stigmata*, the print of nails in the hands and feet, and of a wound in the side, corresponding to similar marks on the person of the Saviour, which Francis brought away with him from one of these interviews. It was even affirmed that blood continued to flow from his wounds; and portions of this blood were long after exhibited for the reverence of the faithful. He was canonized July 16, 1228.—The literary remains of St. Francis are neither numerous nor especially remarkable. They consist of letters, monastic conferences, parables, and poems in the Italian tongue. The best edition is that of 1641 (folio, Paris). The life of the saint has been many times written by brethren of the various branches into which his order has been divided; by Thomas de Celano, his disciple; by St. Bonaventura; by Helyot; by Chalippe (4to, 1728, and 2 vols. 12mo, 1736); by Chavin (8vo, Paris, 1841); by Böhringer; and by Frédéric Morin (16mo, Paris, 1858).

FRANCIS OF PAULA, *Saint*, founder of the order of Minims, born at Paula or Paola, Calabria, in 1416, died at Plessis-les-Tours, France, April 2, 1507. His family name has been variously given as Martorello, Martotillo, and Retortillo. Commynes, who gives all the details of his stay in France, constantly calls him Frère Robert. This may have been his first name, to which that of Francis was added at a later date. He was devoted by his parents to St. Francis of Assisi, to whose intercession they ascribed his birth, after their marriage had been long childless. He was early placed in an unreformed convent of Franciscans in Calabria, where he surpassed all the monks in the strict observance of the rule. In 1428 he returned to Paula, resigned his right of inheritance, and retired to a grotto to lead the life of a hermit. He was hardly 20 years old when he found many followers, who built themselves cells near his grotto. He received from the archbishop of Cosenza permission to build a church and convent, which were completed in 1436. From this year dates the establishment of the order of Minims, which adopted the name of hermits of St. Francis. To the

usual three monastic vows (poverty, chastity, obedience) St. Francis added as a fourth perpetual abstinence, not only from meat, but also from eggs and milk, except in sickness. He himself was still more ascetic. He slept on the bare ground, took no food before sunset, often contented himself with bread and water, and sometimes ate only every other day. The fame of miracles reported of him induced Pope Paul II. in 1469 to send his chamberlain to investigate the facts. The report was very favorable. Pope Sixtus IV. confirmed the new order, appointed the founder superior general, and permitted him to establish as many convents as he could. King Louis XI. of France, attacked by a fatal disease, sent for him in the hope of being cured; but Francis waited until, in 1482, the pope ordered him to go. He met the sick king in Tours, and exhorted him to leave the issue of his sickness to the will of God, and to prepare himself for death. The successor of Louis, Charles VIII., retained the saint in France, and consulted him in cases of conscience as well as in state affairs, and built for him two convents in France and one in Rome. Francis was canonized by Leo X. in 1519.

FRANCIS DE SALES, a saint and bishop of the Roman Catholic church, born at the château de Sales, near Annecy, Savoy, Aug. 21, 1567, died in Lyons, Dec. 28, 1622. Both his parents were of noble birth. Francis, their eldest son, was sent successively to the college of Annecy, to the Jesuits' school in Paris, and to Padua, where he studied law, and at the age of 20 received the degree of doctor of laws. His inclination, nevertheless, was toward the ecclesiastical life. He refused repeatedly the offered dignity of senator, and finally obtained his father's permission to accept the place of provost in the cathedral at Geneva. On being ordained deacon, he gave the first proofs of his eloquence as a preacher. His earnest manner, and the spiritual elevation and beauty of his thought, gave him a powerful hold on his audiences. He was raised to the priesthood in 1593, and immediately gave himself up to the impulses of his zeal. He went on foot through the neighboring villages, visited the prisons, and became everywhere known as the friend of the sick and the poor. Accompanied by his cousin, Louis de Sales, he went on a mission among the Protestants of the province of Chablais. All sorts of difficulties were thrown in his way, and nearly four years passed by without any considerable impression upon the masses. At last, however, conversions multiplied; new missionaries came to his aid, and in 1598 the Catholic religion was publicly restored and the reformed faith was suppressed throughout the province. Repeated conferences were held with distinguished Protestant leaders, and the brilliant success of Francis in the argument with La Faye led the pope to select him to deal with Theodore Beza; but in this case he was not able to report a conversion. In 1599 he was chosen coadjutor to

the bishop of Geneva, whose death in 1602 left to Francis the full charge of the diocese. His episcopal life was characterized by the same zeal, vigor, and devotion which had marked his missionary career. He went first to Paris, where he preached before Henry IV. in the chapel of the Louvre, and the most tempting offers of wealth and position were made to retain him in France. But he preferred to return, and after assisting the cardinal de Bérulle in the establishment of the Carmelite order and the congregation of the Oratory, he went back to Switzerland. He established new and stricter rules, not only for the clergy and laity of his diocese, but for his own personal conduct. He renounced all luxuries, multiplied fasts, discouraged lawsuits, and reformed the lax discipline of the monasteries. His fame as a preacher led various cities to solicit his aid in the services of the Lenten season. He was more than once chosen, from his moderate and peaceful temper, to reconcile dissenting parties and orders in the church. A still wider renown was given to his name by the publication (in 1608) of *L'Introduction à la vie dévote*. It was translated into many tongues, and in less than 50 years 40 editions of it were published. Francis was far from undervaluing monastic institutions. He not only established convents of existing orders, but, in conjunction with the widowed baroness de Chantal, founded the order of the Visitation. Having become acquainted with that lady during a visit to Paris in 1604, he communicated to her his plan of a new order of nuns. In 1610, at Annecy, he gave the habit of the new society to her and two other ladies. In 1616 he published his *Traité de l'amour de Dieu*, a fit sequel to his "Introduction." The appointment of a younger brother as assistant bishop enabled him to give himself more fully to the work of conversion. The famous Calvinistic leader Lesdiguières became one of his converts. In 1619 he visited Paris as one of the embassy sent to secure the hand of the princess Christine for the young prince of Piedmont. His preaching in this visit revived the impression which it had made in the previous reign. On his return to his own diocese he applied himself more resolutely than ever to the ministration of alms, the suppression of scandals, and exercises of personal discipline. In 1622 he accompanied Louis XIII. of France from Avignon to Lyons, where on Christmas day, after preaching, he was attacked with apoplexy, and died. The works of St. Francis have been often published. The best editions are that of Louis Vivès (14 vols. 8vo, Paris, 1857-'9), and that of Périsse frères (5 vols. 8vo, Lyons, 1855 and 1864).

FRANCISCANS, Gray Friars, or Minorites (Lat. *Fratres Minores*), a religious order in the Roman Catholic church, founded in 1209 by St. Francis of Assisi. When the number of his disciples had increased to ten, he gave them in 1210 a rule, in which strict poverty and a union of the

active and contemplative life are the principal points. The order was orally confirmed by Innocent III. in 1210, and again in 1215, and spread with such rapidity that 5,000 brethren were assembled at the general chapter in 1219. In 1223 Honorius III. by a bull confirmed the order as the first among the mendicant orders, gave them the right of collecting alms, confirmed to the church of Portiuncula the celebrated indulgence which was afterward extended to all the churches of the Franciscans, and granted them several other privileges. The vow of poverty made the Franciscans favorites with all classes of the people, and thus secured them large numbers of novices. Forty-two years after the death of the founder the number of Franciscans was estimated at about 200,000, with 8,000 convents in 23 provinces. At the head of each convent was a guardian; the guardians of a province chose a provincial, who was assisted by *definitores*; the general assembly of all the provincials (general chapter) elected a general, and likewise definitores. The simplicity of the rule left room for the greatest variety of opinions. This showed itself during the lifetime of the founder, one party wishing to have the vow of poverty mitigated, the other strenuously opposing any such change. The strife continued from 1219, when Elias of Cortona, the first leader of the milder party, was made by St. Francis himself vicar general of the order, till 1517, when Leo X. divided them into two separate organizations. At the election of almost every new general we find the two parties in competition, the popes themselves sometimes siding with the one, sometimes with the other. The milder party, when in a minority, submitted; but the rigorous party, when prevented from upholding the whole rule of St. Francis, preferred to form separate branches. In several cases they went so far as to appeal from a decision of the pope to a general council. As early as 1286, when Elias of Cortona, after having been once expelled, was reelected general of the order, Cæsarius of Spire left it, followed by 72 others, called after him the Cæsarines or Cæsarians; but they were reconciled with their brethren in 1286, at the restoration of a stricter observance by St. Bonaventura. The lax government of the general Matteo di Aquas Spartas caused in 1294 the foundation of the Minorite Celestines, who after the death of their protector, Celestine V., were in 1307 condemned as heretics and suppressed. Some of them who fled to France established in 1308 the Minorites of Narbonne and the Spirituals, who were likewise condemned in 1318. Another offshoot of Celestines, the Minorite Clarenines, founded in 1302 by Angelo di Cortona, was tolerated till 1506, when they united with the Observants. Much more successful than these secessions was the undertaking of Paoletto di Foligno in 1368 to restore the strict observance of the rule. His followers were called Observants, and those who adhered to the milder rule

Conventuals. Henceforth these two names distinguished the two great parties. By the 16th century the number of new congregations had thrown the order into great confusion. Leo X. made an attempt in 1517 to reunite them, but succeeded only with the various congregations of Observants, on whom he therefore conferred the right of electing the general (*minister generalis*), while the Conventuals could only elect a magister general (*magister generalis*), whose election had to be confirmed by the general. From that time the quarrels between the Observants and Conventuals were less violent. The Conventuals made several attempts to regain the ascendancy, but in 1631 Urban VIII. commanded them to abandon their claims for ever. Notwithstanding the desire of the pope that no further separations should occur, several congregations arose, mostly for the purpose of still surpassing the strict observance of the Observants. These communities were styled Minorites of the stricter observance, and, though forming separate provinces from the main body of the regular Observants, were always under the same general. They were called Alcantarines in Spain from St. Peter of Alcántara, Reformed in Italy and Germany, and Recollects in France, England, Ireland, Belgium, and Holland. The Capuchins, originally a congregation of reformed Franciscans, became afterward an independent order. (See CAPUCHINS.)—The number of Franciscans has been greatly reduced by political revolutions since 1789. In the 18th century the order, including the Capuchins, still counted nearly 200,000 members with about 26,000 convents; in 1848 the number of the Observants, the most numerous branch, was estimated at about 80,000. Since 1848 the number of the order has been gradually increasing in the British empire, the United States, Belgium, Holland, France, and Germany; in the Italian and Spanish peninsulas they have now completely ceased to exist as religious corporations; while in Mexico a law has recently been passed abolishing all religious orders, secularizing their members, and sequestering their property. In Asia they have a province in Palestine, whose members are the guardians of the holy sepulchre and other Christian sanctuaries, and are celebrated for their hospitality to pilgrims and travellers. In China they have charge of two apostolic vicariates. The Franciscans were the earliest missionaries to America, having come over with Columbus on his second voyage in 1493. Their first formal establishment in the new world was in 1502, when 12 friars, with a prelate named Antonio de Espinal, accompanied Ovando to Santo Domingo. They went to Florida with Pamfilo de Narvaez in 1528, one of their number, Juan Juarez, bearing the rank of bishop; but of this band of missionaries we know little; they seem to have effected no establishment, and all perished. An Italian Franciscan, Mark of Nice, penetrated into New

Mexico and California in 1539, and gave the name San Francisco to the country which he visited. The exaggerated reports of what he had seen and heard led adventurers to those regions, and with them came a number of Franciscans, some of whom remained behind after the return of the expedition and were martyred. Father Andrés de Olmos founded a successful mission in Texas in 1544. Subsequently priests of this order established themselves permanently in Florida, California, Mexico, and other parts of the south and west, and were among the first to plant Christianity in Canada, and in what are now the northern and northwestern states of the Union. Their labors in Canada date from 1615, when four Recollects (three priests and one lay brother) came over from France and took charge of the Huron, Algonquin, and Montagnais missions, which they and their brethren conducted alone until the Jesuits came to aid them in 1625. The Recollects figured largely in the missionary history of Canada for many years. The celebrated explorer Hennepin was a Franciscan missionary. The foundations of the order in California, notwithstanding the numbers who were put to death by the Indians, still remain, and have recently been reinforced by accessions from Europe. They are numerous in all parts of Central and South America. Their present houses in the United States, except those in California, have been founded very recently, chiefly by Italians and Germans. In 1873 the following establishments existed in the United States, having altogether 80 priests: two convents in New York city; a college and convent in Alleghany, N. Y.; a convent in Buffalo; a college and convent in Teutopolis, Ill.; besides convents in Winsted, Conn., Cleveland, Detroit, Cincinnati, St. Louis, Louisville, Nashville, Oldenburg, Ind., and Quincy, Ill. The Conventuals have convents in Austria, Bavaria, Switzerland, Malta, Poland, and Turkey.—We find Franciscans soon after the death of St. Francis as professors of theology at the university of Paris, which in 1244 was commanded by Pope Innocent IV. to admit Franciscans and Dominicans to academical dignities. In union with the Dominicans they strove for several centuries to extend in the theological schools the influence of the monastic orders at the expense of the secular clergy. With the Dominicans they maintained various philosophical and theological controversies, the Franciscans being realists, anti-Augustinians, and defenders of the immaculate conception, while the Dominicans are nominalists and Augustinians, and were formerly opponents of the immaculate conception. Among the celebrated men produced by the order are Anthony of Padua, Bonaventura, Alexander of Hales, Duns Scotus, Roger Bacon, Nicolaus de Myra, Occam, Cardinal Ximenes, and the popes Nicholas IV., Alexander V., Sixtus IV., Sixtus V., and Clement XIV. In the first period of their history they had a considerable number of mystical

writers and composers of hymns, as Thomas de Celano, the reputed author of *Dies Ira*, and Giacopone da Todi, the author of the *Stabat Mater*.—St. Francis also established an order of nuns, who are generally called, from its first abbess Clara of Assisi, Poor Clares or Clarisses. Another branch were the Tertiarians or penitents of the third order of St. Francis, who remained in the world, but followed a rule and discipline similar to those of the first and second orders. They received their rule from St. Francis in 1221. This order has included many kings and queens (as Louis IX. of France, and the mother and wife of Louis XIV.) and popes among its members, Pius IX. being one. The Tertiarians afterward began to live in community and take vows, but this practice was in time abandoned. New communities of Tertiarians subsequently sprang up, devoted to teaching, and became independent of the parent order. They have houses in Pennsylvania, Indiana, Michigan, Wisconsin, and Brooklyn, N. Y. Among the communities of women, the Elizabethines, founded in 1395 by Angelina di Corbaro, are the most important. In France they were also called daughters of charity. In 1843 they had about 1,000 members; but since then their numbers have much increased. In the United States there are establishments of sisters of the third order of St. Francis in the dioceses of Vincennes, Milwaukee, Cincinnati, and Sault Ste. Marie.—The habit of the Observants consists of a cowl with a pointed capuche, a cord as a girdle, and sandals. Its color differs in different localities. In England and Ireland it is gray, whence the name "gray friars." Some congregations let the beard grow. The Conventuals generally wear a black cowl and capuche. They also wear shoes, and are always without beards.—The principal work on the Franciscans is that of the Irish Franciscan, Lucas Wadding (died in 1657). His *Annales Minorum* (8 vols. fol., Lyons, 1625-'48, and Rome, 1654) was continued by De Luca, Fonseca, and others. In the latest edition (24 vols. fol., Rome, 1731-1860), Wadding's work terminates with vol. xvi.

FRANCK, Adolphe, a French philosopher of Jewish parentage, born at Liocourt, department of Meurthe, Oct. 9, 1809. He studied at Nancy and Toulouse, taught in various institutions, and since 1854 has been professor of international law at the collège de France. His *La Kabbale, ou Philosophie religieuse des Hébreux* (1843), was translated into German by Jellinek (1844), and he has written on penal and ecclesiastical law and various other subjects. He edited the *Dictionnaire des sciences philosophiques* (6 vols., 1844-'52), and has contributed to the *Journal des Débats* and to the annals of the academy of moral and political sciences, of which he is a member. Since 1805 he has been a member of the superior council of public instruction. In 1873 he resigned the office of vice president of the Hebrew consistory.

FRANCKE, August Hermann, a German preacher, founder of the orphan house at Halle, born in Lübeck, March 23, 1663, died June 8, 1727. He studied at the universities of Erfurt, Kiel, Gotha, and Leipsic, and founded in Leipsic a school for the interpretation of the Scriptures, which attracted a great number of students. Accused of pietism, he was obliged to renounce this employment in 1691, and passed to Halle, where he taught the Greek and oriental languages in the university, and also became pastor of the church of St. George. Here he founded a charitable institution for the education of poor children and orphans, which soon became one of the most considerable in Germany. A chemist, whom he had visited on his deathbed, bequeathed to him the recipe for compounding certain medicines, which afterward yielded an annual income of more than \$20,000, and made the institution independent. It combines an orphan asylum, a pædagogium, a Latin school, a German school, and a printing press for issuing cheap copies of the Bible. It now contains 800 inmates.

FRANÇOIS. I. Jean Charles, a French engraver, born in Nancy in 1717, died in Paris in 1769. He was among the first to introduce engravings representing crayon and chalk drawings, and was pensioned by Louis XV., who employed him extensively. His best known works represent that king and his queen, Bayle, Erasmus, Locke, and Malebranche. **II. Charles Remy Jules**, a French engraver, born in Paris, Dec. 24, 1809. He early produced, after the manner of his master Henriquel-Dupont, admirable engravings of pictures by Vandyke and Raphael, and subsequently was exclusively employed in reproducing the paintings of Delacroix. He has resided in Brussels since 1858.—His brother **ALPHONSE**, born in Paris in 1811, excels in the same branch of art.

FRANCOLIN, a gallinaceous bird of the grouse family, subfamily *perdixinae* or partridges, and genus *francolinus* (Steph.). There are about 30 species found in the warm parts of the eastern hemisphere, especially in Africa; some prefer open plains, where they roost in trees, and others woody places; when alarmed, they conceal themselves in the brushwood, or run with considerable speed, taking wing only when hard pressed; their food consists of bulbous roots, grains, and insects, and they feed in early morning and at evening. The bill is longer than in the common partridge; the wings are moderate and rounded, the third, fourth, and fifth quills the longest; the tarsi are strong and spurred; the feet four-toed. The francolin of Europe (*F. vulgaris*, Steph.), in the male, has the plumage of a general yellowish brown color, each feather with a dark centre; the ear covers white; circle round the eyes, cheeks, and sides of head, and the throat, deep black, below which is a broad chestnut collar extending around the neck; the rump and tail white barred with black; the outer feather of the latter entirely black; breast and lower parts

black; sides blotched with black and white; under tail coverts chestnut; bill black. The female is without the black markings and chestnut collar, and her bill is brown. This is the only species indigenous in Europe, where it is found in the southern parts; it also occurs in

Fraucollinus vulgaris.

northern Africa and the greater part of Asia. The flesh is delicate, and much esteemed in India. According to Gould, this genus seems to form a connecting link between the brilliant pheasants and tragopans of the East and the sober-colored partridges of Europe; to the splendid colors of the former it unites the form and habits of the latter.

FRANCONIA (Ger. *Franken*, or *Frankenland*, land of the Franks), an old duchy and afterward a circle of the German empire. In the 5th century it formed a part of the Thuringian kingdom, on its dismemberment fell to the Franks, and on the breaking up of the Carolingian empire to Germany. In the latter empire it rose to foremost importance, and five Franconian dukes were elected emperors (Conrad I. and II., Henry III., IV., and V.). It then embraced extensive lands, chiefly between the Rhine and the Bohemian mountains, but subsequently was weakened by divisions, was broken up into small territories, and disappeared as a duchy. In 1512 Maximilian I. erected a part of it into a circle of the empire, including the ecclesiastical dominions of Würzburg, Bamberg, and Eichstädt, the principalities of Baireuth and Anspach, and the imperial cities of Nuremberg, Schweinfurt, Rothenburg, Weissenburg, and Windsheim. During and after the Napoleonic wars it was partitioned among Würtemberg, Baden, Hesse-Cassel, Saxony, and Bavaria, the last named state receiving the largest portion, and still retaining the name in the three districts of Upper, Middle, and Lower Franconia.—**UPPER FRANCONIA** (Ger. *Oberfranken*) nearly corresponds with the former circle of Upper Main, and lies in the N. E. part of the kingdom, bordering on Bohemia and Saxony; area, 2,702 sq. m.; pop. in 1872, 540,963. It is a mountain region, occupied in the east by a portion of the Fichtelgebirge, and

rich in gypsum, marble, gold, silver, lead, and iron. Agriculture and cattle raising are carried on with success. Capital, Baireuth.—**MIDDLE FRANCONIA** (Ger. *Mittelfranken*) comprises that portion of territory anciently known as the circle of Rezat, and includes the former margravate of Anspach, the bishopric of Eichstädt, and part of Baireuth; area, 2,918 sq. m.; pop. in 1872, 583,417. It touches Würtemberg on the west. It is intersected by branches of the Franconian Jura, and a small portion of the mountainous district is too rough for tillage, but three fourths of the circle is in a high state of cultivation, producing the grape, tobacco, pasturage, and hops. There are few minerals, but important manufactures are carried on in most of the towns. Capital, Nuremberg.—**LOWER FRANCONIA** (Ger. *Unterfranken*), nearly identical with the former circle of Lower Main, comprises the old bishopric of Würzburg and part of that of Fulda, with several smaller territories; area, 3,342 sq. m.; pop. in 1872, 586,122. It is bounded N. E. by the Saxe duchies, E. by Upper and Middle Franconia, S. by Würtemberg and Baden, W. by Darmstadt, and N. W. by Prussia. The N. part is traversed by the Rhön mountains, and the S. W. by the Spessart. There are several extensive forests, but the plains and river bottoms are well cultivated, producing grain, potatoes, hops, and the grape. Capital, Würzburg.

FRANCONIA NOTCH. See **WHITE MOUNTAINS**.

FRANEKER, a town of the Netherlands, in the province of Friesland, on the Trekschuyten canal, between Harlingen and Leeuwarden, 10 m. W. of the latter; pop. in 1867, 6,298. In 1585 a university was established here, which long occupied a high position among the learned institutions of Europe, and counted among its professors such men as Schultens, Hemsterhuis, and Valckenaer. Napoleon I. abolished it in 1811; in 1816 an atheneum was established in its place, which was subsequently changed into a gymnasium, with which a physiological cabinet, a botanical garden, &c., are connected. The university buildings have been appropriated for an insane asylum.

FRANK. **L. Johann Peter**, a German physician, born at Rothalben, Baden, March 19, 1745, died in Vienna, April 24, 1821. He first studied theology, then medicine, taking his degree at Heidelberg in 1766, and after practising at Bruchsal and elsewhere, became physician to the prince-bishop of Spire. Acquiring prominence as a lecturer and in the training of midwives, he was appointed professor of physiology and medical police at Göttingen in 1784; but on account of his health he went to Italy the next year, succeeded Tissot in the chair of clinics at Pavia, was appointed sanitary inspector general of Lombardy, and introduced reforms in medical instruction and practice. The rank of councillor was conferred on him by the king of England, and later by the emperor of Austria, who employed him in 1795 for the regulation of the sanitary service of the army

and as director general of the principal hospital of Vienna. In 1804 he went to Wilna as professor of clinics, was afterward first medical adviser of the czar and professor at the medical and surgical academy of St. Petersburg, and returned to Vienna in 1808. Napoleon consulted him in respect to Marshal Lannes, and offered him a brilliant post in France; but he remained in Germany. His advice was sought in 1814 for Maria Louisa. Among his principal works are: *System einer vollständigen medicinischen Polizei* (9 vols., including supplement, 1784-1827), and the unfinished *Építome de Curandis Hominum Morbis* (6 parts, 1792-1800; 7th part, by Eyerel, 1821). His autobiography appeared in 1821, and his *Opuscula Posthuma* were published in 1824 by his son. **II. Joseph**, a German physician, son of the preceding, born at Rastadt, Dec. 23, 1771, died at Como, Dec. 13, 1842. He was assistant of his father in Pavia and Vienna, and became in 1804 professor of pathology at Wilna, retiring in 1824 on account of a disease of the eyes. He was one of the most influential advocates of the Brunonian system of physic, and published *Grundriss der Pathologie nach den Gesetzen der Erregungstheorie* (Vienna, 1803). His *Præceps Medicæ Universæ Præcepta* (Leipsic, 2d ed., 1828-'43) has been translated into German (9 vols., 1828-'43) and French.

FRANKEL, Zacharias, a German rabbi and author, born in Prague, Oct. 18, 1801, died Feb. 13, 1875. He studied in Pesth, became rabbi at Leitmeritz in 1832, and chief rabbi for Dresden and Leipsic in 1836. He contributed greatly to improve the civil status of the Jews in Saxony, and indirectly in other parts of Germany. In 1854 he became director of the Jewish seminary at Breslau, which was opened in that year, and which has become through his influence a celebrated seat of Hebrew learning. His principal writings are: *Die Eidesleistung der Juden* (Dresden, 1840), which led to a liberal modification of the oath required from Jews in Saxon, Prussian, and other German courts of law; *Hodegetica in Mischnam* (Leipsic, 1859, with additions in 1865); *Grundlinien des mosaisch-talmudischen Ehrechts* (Breslau, 1859); *Entwurf einer Geschichte der Literatur der nachtalmudischen Responsen* (1865); and *Einleitung in den Jerusalemischen Talmud* (1870). He was also editor of the *Monatsschrift für Geschichte und Wissenschaft des Judenthums*, begun in 1851.

FRANKENHAUSEN, a town of Germany, capital of one of the two sections of the principality of Schwarzburg-Sondershausen, on a branch of the Wipper, 10 m. E. of Sondershausen; pop. in 1871, about 4,900. It has salt works which furnish about 20,000 tons annually, and several manufactures.

FRANKENSTEIN, a town of Prussian Silesia, capital of a circle of the same name, 36 m. S. W. of Breslau; pop. in 1871, 7,328. It has manufactures of stockings, saltpetre, and aquafortis, and a trade in flax, yarn, and grain.

FRANKFORT, a city of Franklin co., Kentucky, capital of the county and state, situated on both banks of the Kentucky river, here 250 yards wide and spanned by two bridges, 62 m. above its mouth, and on the Louisville, Cincinnati, and Lexington railroad, 24 m. W. N. W. of Lexington, and 45 m. E. of Louisville; pop. in 1850, 3,808; in 1860, 3,702; in 1870, 5,396, of whom 2,335 were colored. It is built on a high plain lying between the river and a bluff 150 or 200 ft. high, and is regularly laid out, with neat-looking houses. The portion on the S. side is called South Frankfort. The surrounding country is remarkable for its picturesque scenery. On one of the hills which overlook the city is a handsome cemetery, in which are buried several of the governors and other state officers, and also the remains of Daniel Boone, the pioneer in the settlement of Kentucky. The state monument to those who fell in the war of 1812 and the Mexican war is of white Italian marble. The principal public buildings are the state house, built in 1825 of a light-colored marble quarried from the hills near by, with a handsome Ionic portico; a new structure known as the fire-proof public offices, adapted for the wing of a new capitol; the state institution for the training of feeble-minded children; the state penitentiary, with 650 convicts; a county court house, and a handsome public school building. The river is navigable by means of locks and dams for steamboats 40 m. above the city, and for flat boats 100 m. higher. Frankfort has an important trade in poplar, cherry, walnut, ash, and oak lumber, the logs being rafted down the river and shipped by rail to the east. There are two flouring mills, a cotton mill, six saw mills, five distilleries, three banks with an aggregate capital of \$1,725,000, a tri-weekly and two weekly newspapers, and six churches. The city was laid out in 1787, and became the seat of government in 1792. It was occupied by the confederates for about a month in 1862.

FRANKFORT-ON-THE-MAIN (Ger. *Frankfurt am Main*), a city of Germany, in the Prussian province of Hesse-Nassau, formerly a free city and the seat of the Germanic diet, situated in a fertile valley on the right bank of the river Main, 20 m. above its confluence with the Rhine, near the Taunus mountains, 255 m. S. W. of Berlin; pop. in 1871, 90,922, of whom about 12,000 were Roman Catholics, 7,500 Jews, and the remainder Protestants. The finest street is the Zeil, united in 1856 with the Neue Kräme, and also through the new Liebfrauenstrasse with one of the principal squares, the Liebfrauenberg. The other remarkable public squares are the Rossmarkt, with a monument in honor of the art of printing inaugurated in 1857, the Goethe square, with Schwanthaler's statue of Goethe, who was born here, the Schiller square, with Schiller's statue, and the Römerberg. In the latter is the Römer, or council house, where the German emperors were elected and entertained in

the Kaisersaal, the walls of which are covered with portraits of the emperors. The golden bull of Charles IV., which regulated the election of the emperors, is preserved in the building. The founder of the house of Rothschild and his children were born in the Judenstrasse, but almost the whole W. part of this street has since been pulled down. The streets which command most traffic are the Fahrgasse and Schnurgasse, and among the fine streets are the avenues near the city gates and the Schöne Aussicht along the quay. Frankfort is surrounded by a belt of promenades (*Anlagen*) connecting the gates of the city, which are among the finest pleasure grounds in Europe. Delightful villages, as Bockenheim, Bornheim, Ober-rad, &c., are within a short distance of the city, as well as several watering places, such as Homburg, Soden, and Wiesbaden. There are several private and public picture galleries. The Städel museum, so called after its founder,

1512 attained 267 ft., when the work was discontinued. The interior of the tower was destroyed by fire in 1867, but by the aid of the Prussian government it is to be restored and to be finished according to the original plan. The most celebrated Lutheran churches are the Katharinen Kirche, where the first Lutheran sermon was preached in 1522, and that of St. Paul (formerly Barfüsserkirche), where the German parliament was held in 1848 and 1849. The theatre of Frankfort is among the best in Germany. The post office on the Zeil is a stately building, as well as the exchange. The once famous fairs have declined in importance since the opening of railways, and while the quantity of goods brought to them in 1842 amounted to 102,000 quintals, it was only 34,500 quintals in 1870. The horse fairs, however, are still active. Frankfort continues to be a good market for wine, cider, beer, breadstuffs, and meats. The amount of

duties paid on imports during the year ending Sept. 30, 1872, was about \$775,000. Many diamond dealers having removed from Paris to Frankfort during the Franco-German war, the export of jewelry has increased from only about \$6,000 in previous years to upward of \$200,000 in 1871. The export of human hair and hair work has also increased from about \$400 to over \$70,000, and nearly half of it goes to the United States. The total exports to the United States from Oct. 1, 1871, to Oct. 1, 1872, amounted to \$1,448,925, being chiefly leather,

The Römer.

who bequeathed to it \$400,000 besides valuable art collections, contains a library and a school of art. Bethmann's garden contains Dannecker's "Ariadne" and his colossal bust of Schiller. In the public library are about 100,000 volumes and many important MSS. The museum of the Senkenberg society of naturalists contains among its principal collections that of Dr. Rüppell, the Abyssinian traveller. Besides a gymnasium, there are many public and private schools. The city is divided into 90 alms districts for the relief of the poor, and there are more than 30 charitable institutions and hospitals. There are four Catholic, six Lutheran, and two Reformed churches, four Lutheran chapels, an English chapel, and two new synagogues. The principal of the Catholic churches is the cathedral or church of St. Bartholomew, a Gothic structure, in which from 1711 the German emperors were crowned. The tower of the church had in

hides, skins, better's fur, jewelry and precious stones, and linen, woollen, and cotton goods. There are many banking houses, foremost among which are those of Rothschild and Bethmann. The number of houses, chiefly Jewish, engaged in the stock and exchange business amounts to at least 200. The magnitude of this business is due partly to the great wealth of the city, and partly to its geographical situation, which makes it a convenient medium of exchange; and it is the most important continental market for American securities. The chief local manufactures are carpets, table covers, jewelry, playing cards, oilcloth, tobacco, snuff, and Frankfort black. The extensive manufactories at Offenbach and in other neighboring localities are mainly conducted by Frankfort houses. Since the annexation of the city to Prussia, a great impulse has been given to its industry; and in particular, extensive type foundries and manufactories of sewing

machines and chemicals have been established. The suburb of Sachsenhausen, on the left bank of the Main, and united to Frankfort by a fine stone bridge, is an important market for fruits and vegetables. Leipzig has taken from Frankfort the supremacy which it once possessed in the book trade, but there are 40 booksellers in the city, and several important publishing and engraving establishments. There are about 20 daily and periodical publications. Seven railways proceed from Frankfort, two only for a short distance. The trade on the Main was in 1870 carried on by 728 vessels.—Frankfort is mentioned in 794, under the name of *Palatium Franconensford*, as the place selected by Charlemagne for the seat of an imperial convention and religious council. The independence of the city dates to some extent from the 13th century. Many privileges were conferred upon it in the next century, and it acquired still greater importance by the elections and subsequently by the coronations of the German emperors which took place here. Frankfort was captured by the French in 1759, 1792, and 1796. In 1806 it became the residence of the prince-primate of the confederation of the Rhine, and in 1810, under the same, the capital of a grand duchy, with an area of about 2,000 sq. m., and a population of 300,000. In 1815 it was recognized as one of the free cities of Germany, and in 1816 as the seat of the Germanic diet. From 1848 to 1866 it was governed by a senate of 21 members elected for life, who annually chose a senior and a junior burgomaster, and a legislative assembly of 88 members, elected from all classes and religious denominations. The financial affairs were mainly controlled by a standing committee of 51 citizens, who were elected for life. Changes in the constitution could not be made without the consent of the whole body of citizens. The city had together with the other three free cities the 17th vote in the narrower council of the diet, and was entitled to a full vote in the plenum. On April 8, 1833, the city was the theatre of a political outbreak, for which many students were arrested. In 1836 it joined the Zollverein. In 1848 and 1849 it derived political importance from the German parliament held there. A riot broke out during the excitement about the Schleswig-Holstein war (Sept. 18, 1848), in which the Prussian major general Anerswald and Prince Felix Lichnowsky were killed by the mob. In the German war of 1866 Frankfort sided with Austria, and was on that account annexed to Prussia. On May 10, 1871, a treaty of peace between Germany and France was concluded here.

FRANKFORT-ON-THE-ODER, a city of Brandenburg, Prussia, capital of a district of the same name, on the left bank of the river Oder, 45 m. E. S. E. of Berlin; pop. in 1871, 43,211. The prosperity of the town is due to its situation on the railway between Berlin and Breslau, to its navigable river, which is connected by canals with the Vistula and the Elbe,

and to its three annual fairs, at which large quantities of cotton, woollen, silk, and other goods are sold, though to a less extent than formerly. The city has three suburbs, fine streets, public squares, and gardens, a theatre, many charitable institutions, a Roman Catholic church, a synagogue, and several Protestant churches. The university was removed to Breslau in 1810; a gymnasium still remains. Beyond the wooden bridge which connects the old town on the left bank of the Oder with the suburb on the right bank is a monument to Prince Leopold of Brunswick, who was drowned here in 1785, while attempting to rescue a family during an inundation. The battle of Kunersdorf was fought within 8 m. of the town in 1759, and there is in Frankfort a monument of the poet Kleist, who died from a wound received in this battle.

FRANKINCENSE, a designation of resinous substances which when burned give out an agreeable odor, and are used in the ceremonies of the Roman Catholic church. The common frankincense of commerce, also called gum thus, is an exudation of the Norway spruce (*abies excelsa*). The turpentine from our southern pine forests, also called white turpentine, when old and hard, is often sold as a substitute for the European.—The true frankincense of the ancients is the fragrant gum resin known in medicine as *olibanum*, the product of the tree *Boswellia serrata*, which grows among the mountains of central India and upon the Coromandel coast. It is imported from Calcutta in the form of roundish lumps or tears, which have a pale yellow color, are somewhat translucent, and are covered with a

Olibanum (Boswellia serrata).

whitish powder produced by friction. It has an agreeable balsamic odor, but its taste is acid and bitter; it softens when chewed, adheres to the teeth, and whitens the saliva. It readily inflames, and imparts in burning a fragrant odor. This is the property which rendered it so highly

esteemed with the ancients, by whom it was introduced as one of the ingredients in their incense, which was burned (*incensum*), according to Maimonides, to conceal the smell arising from the slaughtered animals of the sacrifices. According to others, the smoke of its burning was regarded as in itself an acceptable offering, because it was symbolical of prayer and of interior worship. Olibanum is but imperfectly soluble in water. Alcohol takes up about three fourths of it, forming a transparent solution. Braconnot obtained 8 parts of volatile oil, 56 of resin, 80 of gum, and 5-2 of insoluble glutinous matter; loss 0-8. The article finds but little use in medicine except for fumigations, and rarely as an ingredient of plasters.—Another variety of frankincense, the source of which is not well ascertained, is brought from Arabia.

FRANKL, Ludwig August, a German poet of Jewish parentage, born at Chrast, Bohemia, Feb. 8, 1810. He received a diploma as physician in Italy in 1837, but devoted himself to poetry and journalism, was secretary and archivist of the Hebrew community in Vienna, and became in 1851 professor of æsthetics. In 1856 he founded a school in Jerusalem, and described the condition of the Jews in the East in *Nach Jerusalem* (Leipsic, 1858) and *Aus Aegypten* (Vienna, 1860), having sketched that of his Viennese co-religionists in a previous work, *Zur Geschichte der Juden in Wien* (2 vols., 1847-53). Of his little poem *Die Universität*, 500,000 copies were sold in Austria in 1848, owing to its being the first publication issued after the abolition of the censorship. His anonymous *Magyarenkönig* made him popular among the Hungarians, the work having been publicly destroyed by the Austrian authorities in Pesth (1850). His *Ahnensbilder* (2d ed., Leipsic, 1864), and his *Libanon* (4th ed., Vienna, 1867), include poems suggested by his travels in the East. His *Helden und Liederbuch* (2d ed., Prague, 1863) contains his shorter pieces. His finest productions are his epic poems, *Cristoforo Colombo* (Stuttgart, 1836), *Don Juan d'Austria* (Leipsic, 1846), and *Der Primator* (3d ed., 1864). He has also translated several of Moore's and Byron's poems and Servian ballads, the latter under the title of *Gusle*.

FRANKLIN, the name of counties in 22 of the United States. **I.** A W. county of Maine, bordering on Canada, and drained by Dead and Sandy rivers, branches of the Kennebec; area, 1,600 sq. m.; pop. in 1870, 35,866. It has no navigable streams, but there are several mill creeks and small ponds. The Androscoggin railroad terminates at Farmington. The surface is undulating, with a few mountainous elevations, the chief of which are Mt. Blue, Mt. Abraham, and Saddleback. The chief productions in 1870 were 25,407 bushels of wheat, 64,267 of Indian corn, 151,032 of oats, 325,513 of potatoes, 71,211 tons of hay, 101,007 lbs. of cheese, 562,470 of butter, and 267,369 of wool. There were 4,096 horses, 7,108 milch cows, 13,901 other cattle, 57,093 sheep, and

1,604 swine; 5 manufactories of agricultural implements, 6 of boots and shoes, 3 of boxes, 30 of carriages and wagons, 3 of sashes, doors, and blinds, 1 of shoe pegs, 4 of wood turned and carved, 1 of woollen goods, 12 saw mills, 5 tanneries, and 4 currying establishments. Capital, Farmington. **II.** A N. W. county of Vermont, bordering on Canada and Lake Champlain, and drained by Missisquoi and Lamoille rivers; area, 630 sq. m.; pop. in 1870, 30,291. The surface is irregular, and the soil fertile. There are marble quarries and iron mines. The commerce of the county is carried on through Lake Champlain, which is navigable here for vessels of 90 tons, and over the Vermont Central railroad. The chief productions in 1870 were 49,431 bushels of wheat, 116,826 of Indian corn, 808,587 of oats, 335,122 of potatoes, 104,075 tons of hay, 510,226 lbs. of cheese, 2,984,520 of butter, 92,178 of wool, and 830,344 of maple sugar. There were 6,025 horses, 27,624 milch cows, 12,012 other cattle, 20,054 sheep, and 4,564 swine; 19 manufactories of carriages and wagons, 3 of agricultural implements, 1 of cars, 5 of cheese, 1 of confectionery, 4 of barrels and casks, 2 of drugs and chemicals, 1 of iron castings, 3 of lime, 1 of engines and boilers, 11 of saddlery and harness, 6 of sashes, doors, and blinds, 11 of tin, copper, and sheet-iron ware, 5 of woollen goods, 16 tanneries, 15 currying establishments, 14 saw mills, and 3 flour mills. Capital, St. Albans. **III.** A N. W. county of Massachusetts, bordering on Vermont and New Hampshire, intersected by the Connecticut and drained by Miller's and Deerfield rivers; area about 650 sq. m.; pop. in 1870, 32,635. The surface is hilly and in some places mountainous, and the soil is good. The principal channels of transportation are the Connecticut River railroad, the Vermont and Massachusetts, the New London Northern, the Rutland division of the Vermont Central, and the Troy and Greenfield railroads. The Connecticut river has been made navigable here for boats. The chief productions in 1870 were 9,686 bushels of wheat, 23,327 of rye, 159,538 of Indian corn, 76,553 of oats, 8,980 of barley, 221,633 of potatoes, 63,456 tons of hay, 996,548 lbs. of butter, 70,882 of wool, 2,473,265 of tobacco, and 187,253 of maple sugar. There were 4,245 horses, 8,779 milch cows, 14,850 other cattle, 15,959 sheep, and 8,652 swine; 20 flour and 46 saw mills, 7 tanneries, 4 currying establishments, 6 manufactories of agricultural implements, 2 of bricks, 2 of children's carriages and sleds, 12 of wagons, 4 of cotton goods, 2 of cutlery, 13 of furniture, 5 of hardware, 4 of iron castings, 3 of machinery, 1 of pianos, 1 of printing paper, 7 of pocketbooks, 1 of sewing machines, 8 of wooden ware, and 3 of woollen goods. Capital, Greenfield. **IV.** A N. E. county of New York, bordering on Canada, drained by Saranac, Chateaugay, St. Regis, and Raquette rivers; area, 1,764 sq. m.; pop. in 1870, 30,271. The

St. Lawrence touches its N. W. corner. It has an uneven surface, diversified by a great number of small lakes. The S. E. portion is occupied by the Adirondack mountains, the highest peak of which in this county is Mt. Seward, which, according to the survey of 1872, is 4,462 ft. high. Bog iron is found in considerable quantities. Much of the soil consists of rich sandy loam. The Ogdensburgh and Lake Champlain railroad passes through the county. The chief productions in 1870 were 85,049 bushels of wheat, 20,249 of rye, 69,005 of Indian corn, 862,540 of oats, 15,521 of barley, 47,548 of buckwheat, 1,068,083 of potatoes, 66,383 tons of hay, 1,628,045 lbs. of butter, 106,270 of wool, 351,580 of maple sugar, 41,100 of flax, and 753,408 of hops. There were 6,816 horses, 17,138 milch cows, 10,514 other cattle, 25,130 sheep, and 4,625 swine; 3 manufactories of pot and pearl ashes, 4 of boots and shoes, 22 of carriages and wagons, 18 of clothing, 2 of stoves, &c., 1 of engines and boilers, 12 of saddlery and harness, 30 of starch, 3 of woollen goods, 5 planing and 37 saw mills, 9 tanneries, 6 currying establishments, and 12 flour mills. Capital, Malone.

V. A S. county of Pennsylvania, bordering on Maryland, bounded E. by South mountain, N. W. by Tuscarora or Cove mountain, and drained by several creeks; area, 740 sq. m.; pop. in 1870, 45,365. Most of it consists of a rich limestone valley, well watered, and abounding in slate, marble, and iron. In the N. part rises Parnell's Knob, a lofty peak forming the S. W. termination of the Kittatinny range. The county is traversed by the Cumberland Valley railroad. The chief productions in 1870 were 888,727 bushels of wheat, 47,047 of rye, 948,618 of Indian corn, 731,911 of oats, 146,735 of potatoes, 55,439 tons of hay, and 900,710 lbs. of butter. There were 11,278 horses, 10,503 milch cows, 13,704 other cattle, 9,081 sheep, and 28,577 swine; 11 manufactories of agricultural implements, 41 of carriages and wagons, 12 of clothing, 19 of barrels and casks, 18 of furniture, 12 of iron and iron castings, 4 of engines and boilers, 3 of printing paper, 23 of saddlery and harness, 5 of sashes, doors, and blinds, 19 of tin, copper, and sheet-iron ware, 6 of woollen goods, 53 flour mills, 20 tanneries, 15 currying establishments, 4 distilleries, 3 breweries, 1 planing and 10 saw mills. Capital, Chambersburg.

VI. A S. W. county of Virginia, bounded N. E. by Staunton river, and N. W. by the Blue Ridge; area, 864 sq. m.; pop. in 1870, 18,264, of whom 5,996 were colored. The surface is undulating or moderately uneven; the principal mineral is iron; the soil is fertile. The chief productions in 1870 were 77,722 bushels of wheat, 241,919 of Indian corn, 178,231 of oats, 23,218 of Irish and 10,056 of sweet potatoes, 165,499 lbs. of butter, and 1,696,549 of tobacco. There were 2,410 horses, 3,550 milch cows, 5,787 other cattle, 8,848 sheep, and 13,308 swine, and 4 tobacco factories. Capital, Rocky Mount.

VII.

A N. E. county of North Carolina, intersected by Tar river; area about 450 sq. m.; pop. in 1870, 14,134, of whom 7,501 were colored. The surface is level and the soil fertile. The Raleigh and Gaston railroad passes along or near the W. border of the county. The chief productions in 1870 were 23,241 bushels of wheat, 241,435 of Indian corn, 31,659 of oats, 30,135 of sweet potatoes, 2,522 tons of hay, 36,243 lbs. of tobacco, and 3,356 bales of cotton. There were 1,442 horses, 2,593 milch cows, 4,224 other cattle, 3,621 sheep, 4,530 swine, and 2 flour mills. Capital, Louisburg.

VIII. A N. E. county of Georgia, bordering on South Carolina, drained by North and Hudson's forks of Broad river; area, 450 sq. m.; pop. in 1870, 7,893, of whom 1,859 were colored. It has a hilly surface and a productive soil, the river bottoms being particularly fertile. Gold has been found in small quantities, and iron is abundant. The chief productions in 1870 were 18,863 bushels of wheat, 173,007 of Indian corn, 14,151 of oats, 12,335 of sweet potatoes, and 637 bales of cotton. There were 1,093 horses, 1,630 milch cows, 2,590 other cattle, 4,963 sheep, and 5,822 swine. Capital, Carnesville.

IX. A N. W. county of Florida, bounded S. by the gulf of Mexico; area, 475 sq. m., including the islands of St. George and St. Vincent; pop. in 1870, 1,256, of whom 475 were colored. The Appalachicola river, here navigable by steamboats, flows for some distance along its W. border, and then traverses its centre. Its valley is very fertile, but the soil elsewhere is sandy and little cultivated. The surface is low, and much of it covered with swamps and ponds. In 1870 there were only 237 acres of improved land. There was one saw mill. Capital, Appalachicola.

X. A N. W. county of Alabama, bordering on Mississippi; area about 700 sq. m.; pop. in 1870, 8,006, of whom 1,313 were colored. It has a fertile soil, and a hilly surface partly covered with oak and other timber. The chief productions in 1870 were 9,070 bushels of wheat, 264,136 of Indian corn, 7,055 of oats, 10,584 of sweet potatoes, and 2,072 bales of cotton. There were 1,382 horses, 2,156 milch cows, 3,386 other cattle, 3,705 sheep, and 8,608 swine. Capital, Russellville.

XI. A S. W. county of Mississippi, watered by Homochitto river; area about 600 sq. m.; pop. in 1870, 7,498, of whom 3,800 were colored. Its surface is uneven, and its soil fertile near the rivers, but the land elsewhere consists chiefly of pine barrens. The chief productions in 1870 were 124,846 bushels of Indian corn, 28,035 of sweet potatoes, and 5,079 bales of cotton. There were 977 horses, 2,297 milch cows, 4,940 other cattle, and 8,038 swine. Capital, Meadville.

XII. A N. E. parish of Louisiana, watered by Bœuf and Macon bayous, the former of which is navigable by steamboats; area about 500 sq. m.; pop. in 1870, 5,078, of whom 2,844 were colored. Its surface is hilly and its soil fertile. The chief produc-

tions in 1870 were 85,794 bushels of Indian corn, 6,804 of sweet potatoes, and 3,498 bales of cotton. There were 4,932 cattle, and 4,105 swine. Capital, Winnsborough. **XIII.** A N. W. county of Arkansas, bounded S. by the Arkansas river; area about 450 sq. m.; pop. in 1870, 9,627, of whom 651 were colored. The surface is hilly and the soil fertile. The chief productions in 1870 were 13,085 bushels of wheat, 323,444 of Indian corn, 13,520 of Irish and 23,689 of sweet potatoes, and 4,796 bales of cotton. There were 2,561 horses, 3,113 milch cows, 5,923 other cattle, and 27,823 swine; 6 flour and 5 saw mills. Capital, Ozark. **XIV.** A S. county of Tennessee, bordering on Alabama, and intersected by Elk river; area, 780 sq. m.; pop. in 1870, 14,970, of whom 2,972 were colored. The surface is mountainous, especially in the S. E. part. The soil is fertile. The county is traversed by the Nashville and Chattanooga and the Winchester and Alabama railroads. The chief productions in 1870 were 84,357 bushels of wheat, 467,757 of Indian corn, 68,371 of oats, 127,880 lbs. of butter, and 289 bales of cotton. There were 2,945 horses, 3,043 milch cows, 4,778 other cattle, 8,820 sheep, and 24,074 swine; 8 flour and 4 saw mills, 8 tanneries, 8 currying establishments, 8 for wool-carding and cloth-dressing, and 2 cotton factories. Capital, Winchester. **XV.** A N. county of Kentucky, intersected by the Kentucky river, which is here navigable; area, 212 sq. m.; pop. in 1870, 15,800, of whom 4,663 were colored. The surface is diversified and the soil productive. The Louisville, Cincinnati, and Lexington railroad passes through it. The chief productions in 1870 were 28,981 bushels of wheat, 19,837 of rye, 423,295 of Indian corn, 53,638 of oats, 16,472 of potatoes, and 123,250 lbs. of tobacco. There were 2,651 horses, 1,642 milch cows, 2,388 other cattle, 4,170 sheep, and 11,583 swine; 5 manufactories of carriages and wagons, 1 of bagging, 8 of clothing, 3 of barrels and casks, 1 of cotton goods, 1 of malt, 1 of wrapping paper, 1 book-printing establishment, 8 saw mills, 8 distilleries, and 8 flour mills. Capital, Frankfort, which is also the state capital. **XVI.** A central county of Ohio, watered by Scioto and Olentangy rivers; area, 530 sq. m.; pop. in 1870, 63,019. It has a level surface and a rich and generally well cultivated soil. Several railroads centre at Columbus. The chief productions in 1870 were 423,166 bushels of wheat, 1,824,313 of Indian corn, 246,217 of oats, 323,525 of potatoes, 29,484 tons of hay, 688,319 lbs. of butter, and 144,018 of wool. There were 10,565 horses, 7,841 milch cows, 12,271 other cattle, 40,588 sheep, and 43,238 swine; 522 manufacturing establishments, of which the most important were 3 of agricultural implements, 2 of boots and shoes, 12 of bread, &c., 7 of brooms and wisp brushes, 2 of brushes, 32 of carriages and wagons, 1 of cars, 40 of clothing, 1 of rectified coal oil, 2 of vegetable food preparations, 11 of furniture,

1 of gas, 2 of hardware, 1 of saddlery hardware, 1 of hubs and wagon material, 1 of forged and rolled iron, 7 of iron castings, 10 of machinery, 1 of saws, 23 of tin, copper, and sheet-iron ware, 1 of wire, 2 of woollen goods, 8 printing and publishing establishments, 1 distillery, 5 breweries, 6 flour mills, and 4 book-binderies. Capital, Columbus, which is also the capital of the state. **XVII.** A S. E. county of Indiana, bordering on Ohio, and drained by Whitewater river; area, 380 sq. m.; pop. in 1870, 20,223. The surface is diversified and the soil fertile. Blue limestone is found. The Whitewater canal and the Whitewater Valley railroad pass through the county. The chief productions in 1870 were 396,774 bushels of wheat, 771,074 of Indian corn, 143,148 of oats, 21,727 of barley, 59,562 of potatoes, 9,267 tons of hay, 369,005 lbs. of butter, and 40,333 of wool. There were 6,049 horses, 6,032 milch cows, 7,517 other cattle, 11,284 sheep, and 22,489 swine; 8 manufactories of carriages and wagons, 7 of bricks, 10 of barrels and casks, 2 of furniture, 5 of machinery, 2 of printing paper, 10 of saddlery and harness, 1 of woollen goods, 7 flour and 19 saw mills, and 2 distilleries. Capital, Brookville. **XVIII.** A S. county of Illinois, watered by Big Muddy river; area about 400 sq. m.; pop. in 1870, 12,652. The county is heavily timbered; the soil is fertile. The chief productions in 1870 were 111,689 bushels of wheat, 653,299 of Indian corn, 222,426 of oats, 27,968 of potatoes, 23,385 of peas and beans, 4,835 tons of hay, 48,956 lbs. of butter, and 387,382 of tobacco. There were 4,306 horses, 3,280 milch cows, 6,210 other cattle, 18,196 sheep, 25,490 swine, and 8 flour mills. Capital, Benton. **XIX.** A N. central county of Iowa, drained by Iowa river and branches of the Red Cedar; area, 576 sq. m.; pop. in 1870, 4,738. The chief productions in 1870 were 268,231 bushels of wheat, 189,133 of Indian corn, 149,810 of oats, 26,312 of potatoes, 12,008 tons of hay, and 130,882 lbs. of butter. There were 2,370 horses, 1,863 milch cows, 2,832 other cattle, and 3,483 swine. Capital, Hampton. **XX.** An E. county of Missouri, bounded N. by the Missouri river; area, 874 sq. m.; pop. in 1870, 30,098, of whom 2,178 were colored. It is drained by Maramee river, which is navigable by small steamboats. Rich mines of copper, lead, and coal are found on its banks and in other parts of the county. The surface is uneven and well timbered. It is traversed by the Pacific railroad of Missouri and the Atlantic and Pacific railroad. The chief productions in 1870 were 586,921 bushels of wheat, 853,297 of Indian corn, 351,340 of oats, 114,934 of potatoes, 18,017 tons of hay, 273,789 lbs. of butter, 62,988 of wool, 783,270 of tobacco, and 75,954 gallons of wine. There were 6,804 horses, 2,175 mules and asses, 7,477 milch cows, 10,841 other cattle, 16,792 sheep, and 48,703 swine; 30 manufactories of carriages and wagons, 1 of cars, 18 of barrels and

casks, 7 of furniture, 1 of pig iron, 2 of pig lead, 185 of wine, 1 railroad repair shop, 2 pork-packing establishments, 1 planing, 13 saw, and 11 flour mills, 1 box factory, and 8 brick kilns. Capital, Union. **XXI.** An E. county of Kansas, intersected by the Osage river; area, 576 sq. m.; pop. in 1870, 10,385. The surface is undulating and the soil fertile. The Leavenworth, Lawrence, and Galveston railroad passes through the county. The chief productions in 1870 were 44,471 bushels of wheat, 618,840 of Indian corn, 181,515 of oats, 54,618 of potatoes, 17,644 tons of hay, 185,640 lbs. of butter, and 20,498 of wool. There were 3,706 horses, 8,818 milch cows, 7,108 other cattle, 5,182 sheep, and 6,636 swine; 2 manufacturing of boots and shoes, 1 of brooms, 8 of saddlery and harness, 1 flour and 8 saw mills. Capital, Ottawa. **XXII.** A S. county of Nebraska, bordering on Kansas, intersected by Republican river; area, 576 sq. m.; pop. in 1870, 26.

FRANKLIN. I. A borough and the capital of Venango co., Pennsylvania, on French creek or Venango river, just above its entrance into the Alleghany, 52 m. S. by E. of Erie, and 64 m. N. of Pittsburgh; pop. in 1870, 3,908. Small steamers run to Pittsburgh, and railroad communication is furnished by the Franklin branch of the Atlantic and Great Western, the Franklin division of the Lake Shore and Michigan Southern, and the Alleghany Valley line. It owes its prosperity mainly to the trade in petroleum, of which there are many wells in the vicinity. It has two weekly newspapers, a national bank, several oil refineries, a number of schools, and six or seven churches. **II.** A town and the capital of Williamson co., Tennessee, on the Harpeth river, 18 m. S. of Nashville; pop. in 1870, 1,552. A severe battle was fought here, Nov. 30, 1864, between the Union forces under Gen. Schofield and the confederates under Gen. Hood, brought on by the latter to prevent the former from reaching Nashville. After a determined attack the confederates were repulsed. The confederate loss is stated at from 4,500 to 6,000; that of the Union army at 2,326. The result was that Nashville remained in the possession of the Unionists during the remainder of the war. **III.** A town and the capital of St. Mary parish, Louisiana, port of entry of the district of Teche, situated on the right bank of Bayou Teche, 65 m. by water from the gulf of Mexico, and 88 m. W. by S. of New Orleans; pop. in 1870, 1,265, of whom 503 were colored. It is the shipping point for large quantities of cotton, sugar, and corn produced in the neighborhood, and is accessible by large steamboats. In 1872 there were belonging to the port 52 vessels with an aggregate tonnage of 3,853. **IV.** A city and the capital of Johnson co., Indiana, situated on Young's creek, and on the Cincinnati and Martinsville, and the Jeffersonville, Madison, and Indianapolis railroads, 20 m. S. by E. of Indianapolis; pop. in 1870, 2,707. It

is the seat of Franklin college (Baptist), founded in 1835, which in 1872 had 8 professors and instructors, 38 students, and a library of 1,000 volumes. It also contains two national banks, two weekly newspapers, ten public schools, and several churches.

FRANKLIN, Benjamin, an American philosopher and statesman, born in Boston, Jan. 17, 1706, died in Philadelphia, April 17, 1790. He was the youngest, except two daughters, of a family of 17 children. His father, a nonconformist, emigrated to New England in 1682 in search of religious freedom; his mother, his father's second wife, was Abiah Folger, daughter of a distinguished colonist, Peter Folger, author of a poem in defence of liberty of conscience. Franklin's father, originally a dyer, became in Boston a tallow chandler and soap boiler. Having bound out his elder sons apprentices to trades, he designed the youngest "as a tithe of his sons" for the church. The child was placed at school at the age of eight, and manifested an aptitude for study; but narrowed circumstances compelled his early withdrawal, and at the age of ten he was employed in cutting wicks and attending to the shop. This was so distasteful to Benjamin that he began to talk of going to sea, to prevent which his father bound him apprentice to his brother James, a printer. The boy, always fond of reading, now sat up nights engaged in study. His earliest favorites were Defoe's "Essay on Projects," Mather's "Essays to do Good," Bunyan's works, Plutarch, and Burton's historical collections. He conceived also a fancy for poetry, and wrote ballads, the "Lighthouse Tragedy," and the "Pirate Teach, or Blackbeard." These were published, but his father looked discouragingly upon this proceeding, and "thus," humorously says Franklin in his autobiography, "I escaped being a poet." Meeting with an odd volume of the "Spectator," he was so much delighted that he contrived ingenious methods of mastering the style and acquiring an ability in composition which he considered a principal means of his subsequent advancement. At the age of 16 he mastered arithmetic without assistance, and studied navigation. He read also at this period "Locke on the Human Understanding," the "Port Royal Logic," and a translation of Xenophon's "Memorabilia." He had read Shaftesbury and Collins, and becoming a skeptic, applied himself to skilful devices of argumentation gathered from the "Memorabilia," practised them as exercises in conversation, and often defeated antagonists whose cause and understanding were, as he afterward confessed, deserving of the victory. When about 16 years of age he met with a book by "one Tryon," recommending vegetable diet, which he adopted; it proved economical, and he gained thus an additional fund for purchasing books. Meantime he wrote a paper in a disguised hand for the "New England Courant," published by his brother; it was printed anonymously, met with approba-

tion, and excited curiosity. Other communications followed in the same manner, and at length the author was discovered. The brother took it amiss, the circumstance was a first occasion of hard words, and the young apprentice was beaten. Exception was taken by the general court to the political character of Franklin's newspaper. The elder brother was imprisoned, and the future publication of the journal by James Franklin was forbidden. The younger Franklin undertook to elude the interdict by consenting to be nominal printer. This required the cancelling of his indentures as apprentice, but the brother required new and secret indentures. The paper reappeared, and was continued for several months, nominally printed and published by Benjamin Franklin. A fresh difference soon arose between the brothers, and the apprentice, supposing his master would not produce the secret articles of agreement, asserted his liberty. His brother's influence, however, prevented him from getting employment at any of the printing offices in Boston, and he resolved to go to New York in search of work. He accordingly induced the captain of a trading vessel to take him secretly on board, on pretence of escaping the consequences of an unfortunate intrigue. He sold his books, and in three days was in New York, at the age of 17, friendless, almost penniless, and without recommendations. Disappointed there, he went to Philadelphia. His voyage from New York to Perth Amboy in an open boat was eventful; he saved the life of a drunken Dutchman, who fell overboard; and after being 30 hours without food or water, he landed at Amboy, suffering from fever, which he says he cured by drinking plentifully of cold water. He walked thence to Burlington, and took boat to Philadelphia, arriving after some difficulty and danger at the foot of Market street at 9 o'clock on a Sunday morning. He had one dollar, and about a shilling in copper coin; the latter he gave to the boatmen. He bought three rolls of bread, and ate one as he walked up the street with the others under his arms, and his pockets stuffed with stockings and shirts. Thus equipped he passed by the house of his future father-in-law; his future wife was at the door, and remarked the awkward and ridiculous appearance of the passer-by. He gave his rolls to a poor woman, and walked idly into a Quaker meeting house, where he fell into a comfortable sleep; it was the first house and the first repose of which he had the benefit in Philadelphia. He found employment with an unskilful printer named Keimer, and obtained lodging at Mr. Read's, the father of the young lady who had noticed him eating his roll. The governor of the province, Sir William Keith, accidentally saw one of his letters, and was struck with evidences of the writer's superiority. To the amazement of Franklin, Sir William sought him out, proposed to him to set up business for himself, and promised him the public printing. He was

induced by these promises to agree to go to England to purchase types and material; and previously to doing so, to return to Boston to obtain his father's consent. This was withheld, and Franklin returning to Philadelphia remained some time longer with his first employer. In the mean time he had made progress in his courtship of Miss Read. The governor invited him often to his house, and adhered apparently to his original intention of setting him up in independent business. Arrangements therefore were completed for the voyage to London. His father's permission was no longer withheld. Miss Read consented to an engagement, and he embarked, being just 18. On arriving in London he discovered that he had been grossly deceived by the governor. Sir William Keith, "a good governor for the people, planned many excellent laws," but having "nothing else to give, had given expectations." Franklin was alone in a foreign country, without credit or acquaintance, and almost penniless. He promptly sought a printer, and took service for nearly a year. He fell into some extravagance, and committed follies of which he became ashamed, and from which he returned self-rebuked to industry and temperance. He wrote and published a metaphysical criticism upon Wollaston's "Religion of Nature;" his employer saw his talent and ingenuity, but expostulated against the principles advanced in his essay. The pamphlet was an introduction to some literary acquaintances. He had altercations with his fellow journeymen on the subject of temperance; they were beer-drinking sots, and many of them he reformed altogether; he was strong and athletic, while they could carry less and did less work. His skill in swimming attracted observation, and he gave exhibitions of the art at Chelsea and Blackfriars, which excited so much attention that he meditated opening a swimming school, and wrote two essays upon swimming; but in the mean time he entered into engagements with a good man, Mr. Denham, to return to Philadelphia and be his clerk in a dry-goods shop. They sailed from Gravesend July 23, 1726, and landed at Philadelphia Oct. 11. He kept an interesting journal of the voyage. He had been 18 months in London, had profited by advantages of acquaintanceship and books, but was unimproved in his fortunes. Sir William Keith had been superseded as governor; Franklin met him in the street, but seeing that he looked ashamed, passed on without remark. To Miss Read he had written but once during his absence, and that was to say that she was not likely to see him soon. She had been persuaded to marry another, but her husband had absconded in debt, and under suspicion of bigamy. Franklin attributed her misfortunes to his own conduct, and resolved to repair his error. It was doubtful whether a marriage with her would be valid; it had not been clearly ascertained that his "predecessor," as he styles him, had had a previous wife, and Frank-

lin, whom Mr. Tuckerman calls the incarnated common sense of his time, did not forget that he might be called upon to pay his predecessor's debts. "We ventured, however," he adds, "over all the difficulties, and I took her to wife on the 1st of September, 1730." She proved a good and faithful helpmate. Some time before his marriage he suffered a serious illness; a similar illness carried off his employer; and Franklin, forming a connection shortly afterward with a person who had money, established the "Pennsylvania Gazette," which was managed with great ability. He had already written the "Busybody," a series of amusing papers, for another journal, and was the leading member of a club called the Junto, in which questions of morals, politics, and philosophy were discussed. He very soon became a man of mark; his great intelligence and industry, his ingenuity in devising better systems of economy, education, and improvement, now establishing a subscription and circulating library, now publishing a popular pamphlet on the necessity of paper currency (having previously invented a copper-plate press, and engraved and printed the New Jersey paper money), and presently also his valuable municipal services, rapidly won for him the respect and admiration of the colonies. In 1732 he first published his almanac, under the name of Richard Saunders. It took the name of "Poor Richard's Almanac," and was continued profitably about 25 years. The wise saws, the aphorisms, and encouragement to virtue and prosperity through the excellent proverbial sentences with which he filled the corners and spaces, became very popular, and they were at length spread over England and France in reprint and translations. In 1733, at the age of 27, he began to study the French, Italian, Spanish, and Latin languages; and after ten years' absence from Boston, he revisited the scenes of his childhood, healing family differences, and consoling the deathbed of his brother with promises of provision for his son. Returning to Philadelphia, he was elected clerk to the assembly. Soon afterward he was appointed postmaster, and turning his mind upon municipal affairs, wrote papers and effected improvements in the city watch, and established a fire company. He became the founder of the university of Pennsylvania and of the American philosophical society (1744), took an active part in providing for defence against a threatened Spanish and French invasion, and invented the economical stove which bears his name; he declined to profit pecuniarily from this invention, although invited to do so by the offer of a patent. While in Boston in 1746, he witnessed some imperfect experiments in electricity; and having now means sufficient to withdraw from private business, he purchased philosophical apparatus and began his investigations (for an account of which see *ELECTRO-MAGNETISM*, and *LIGHTNING*). The invention of the lightning rod was

a practical application of discoveries the most brilliant which had yet been made in natural philosophy. But he was not allowed to proceed immediately with his scientific pursuits. He was elected to the assembly in 1750; was appointed commissioner for making an Indian treaty, and in 1753 deputy postmaster general for America; and was presented with the degree of master of arts by Harvard and Yale colleges. In 1754, the French war impending, he was named a deputy to the general congress at Albany. He proposed a plan of union for the colonies, which was unanimously adopted by the convention, but rejected by the board of trade in England as too democratic. He was ever afterward actively and zealously engaged in national affairs. We find him in Boston in 1754; and the French war having begun, he assisted Mr. Quincy in procuring a loan in Philadelphia for New England. He visited Braddock in Maryland, and modestly remonstrated against that general's expedition which resulted so disastrously. As postmaster general he was called upon to facilitate the march of the army, and labored faithfully, and even to his own pecuniary disadvantage, in the service. After the defeat of Braddock, he was the means of establishing a volunteer militia, and took the field as military commander. After a laborious campaign it was proposed to commission Franklin as general in command of a distant expedition; but he distrusted his military capacities and waived the proposal. He resumed his electrical researches, and wrote accounts of experiments, which were read before the royal society of London, and procured for him the honor of membership and the Copley gold medal, and were published in England and France. Sir Humphry Davy says of these papers that their style and manner are almost as admirable as the doctrine they advance. Franklin, he said subsequently, seeks rather to make philosophy a useful inmate and servant in the common habitations of man, than to preserve her merely as an object of admiration in temples and palaces. Though it has been said of him by English historians that he had usually a keen eye to his own interests, they are forced to add that he had ever a benevolent concern for the public good. While an active member of the Pennsylvania assembly, he was indefatigable with his pen. The proprietary persisted in measures conflicting with the privileges of the inhabitants and with the public good; in consequence of which the deputies resolved to petition the home government for redress, and appointed Franklin their commissioner for the purpose. He published afterward (1759) the "Historical Review," which contained his papers in aid of the cause of his constituents, and had meanwhile obtained so much reputation that Massachusetts, Maryland, and Georgia intrusted him with the agency of their affairs also. On making the English coast, the ship in which he had embarked narrowly escaped the rocks.

In describing the circumstance to his wife he said: "Were I a Roman Catholic, I should perhaps vow to build a chapel in gratitude for this escape; but as I am not, if I were to vow at all, it should be to build a lighthouse." He arrived in London July 27, 1757. Honors and compliments in abundance awaited him. Oxford and Edinburgh conferred upon him their highest academical degrees. He made personal acquaintance with the most distinguished men of the day, but never failed to bestow his principal attention upon the object of his mission. An illness of eight weeks retarded progress, and great difficulties followed from many circumstances. Three years elapsed, and at length he succeeded in the principal objects of his mission, to the entire satisfaction of his constituents. He suggested to the ministry the conquest of Canada, and his scheme was adopted. With Lord Kames and others in Scotland he passed six weeks of the "densest happiness," as he called it, of his life. He gave Lord Kames the famous "Parable against Persecution." He made further experiments in electricity, invented a musical instrument, the armonica (musical glasses), and received from the ministry the appointment of his son to the governorship of New Jersey. At the end of five years he embarked for home, reached Philadelphia Nov. 1, 1762, and received the official thanks of the assembly. New difficulties arising between the province and the proprietaries, he was again appointed agent to the English government, to petition that the king take Pennsylvania affairs into his own hands. He reached London early in December, 1764. The revolution was imminent. The project of taxing the colonies had been announced, and Franklin was the bearer of a remonstrance against it on the part of the provincial government of Pennsylvania. He was indefatigable in his exertions to prove the unconstitutionality and impolicy of the stamp act; and when the repeal of this obnoxious measure was attempted he underwent an examination before the house of commons (Feb. 3, 1766). His conduct made it an everlasting record of his firm and patriotic spirit, of his wise and prompt foresight, the semblance of an almost inspired sagacity. The repeal of the stamp act was an inevitable consequence. He subsequently travelled in Holland and Germany with his friend Sir John Pringle, and visited Paris, where he met with much attention. Temporary tranquillity in America after the repeal of the stamp act was followed by commotions in Boston occasioned by the equally offensive revenue act, and others subversive of colonial rights. In 1772 a member of parliament, to convince Franklin that every grievance complained of by the Americans originated not with the British government, but with Tories in America, gave him a number of letters written from Massachusetts by Gov. Hutchinson and Lieut. Gov. Oliver, warmly urging coercive measures against the

colonies. Franklin immediately sent these letters to the speaker of the Massachusetts house of representatives. Their publication caused great indignation in America, and was of invaluable service to the popular cause. The Massachusetts house petitioned the king that he would remove Hutchinson and Oliver from the government. Franklin appeared before the privy council, Jan. 29, 1774, to present their petition and advocate the removal. "He was now," says Bancroft, "thrice venerable, from genius, fame in the world of science, and age, being already nearly threescore years and ten." He was grossly reviled and shamefully insulted by Wedderburn, the solicitor general, who made against him a long personal harangue, amid the applauding laughter and cheering of the lords in council. Franklin bore this contumely with his accustomed patience and dignified equanimity. The petition was rejected, and the next day he was dismissed from the office of deputy postmaster general. Meanwhile he found time for further research in science, for journeys again to Paris, Scotland, and Wales, and a visit to Ireland. He had determined to await in England the result of the continental congress. In the mean time Mrs. Franklin died. His parents and 15 of his sisters and brothers had long been dead. A daughter alone was to remain to his solitude, his cherished son being about to sacrifice the ties of kindred to loyalty or political ambition. Franklin embarked for home in March, and arrived May 5, 1775, 16 days after the battle of Lexington. He had labored faithfully in England to prevent the final outbreak, and now repaired as faithfully to his duties in the congress. As a member of the committees of safety and foreign correspondence he performed most valuable services, exerting all his influence for a declaration of independence. That instrument he had the honor to assist in drafting, and to sign, July 4, 1776. He was sent soon after to Paris as commissioner plenipotentiary, together with Silas Deane and Arthur Lee. During the voyage he continued some interesting experiments which he had begun in the spring of the same year in relation to the Gulf stream. He was the first to make observations of this current; and his chart of it, published 90 years ago, still forms the basis of charts now in use. On arriving in France Franklin established himself almost immediately at Passy. A French writer, Lacretelle, says that "by the effect which Franklin produced, he appears to have fulfilled his mission, not with a court, but with a free people." He was not at first received officially, but soon gained influence with the ministry; and after the news of Burgoyne's disaster he concluded the treaty of Feb. 6, 1778. English emissaries came to Paris thereupon to sound Franklin on the subject of reconciliation, of which they discovered that independence was to be the sole basis. His prudence and sagacious firmness defeated every attempt of the British

government to sow discord between America and her ally. He was now accredited to the French king as minister plenipotentiary (1778), and subsequently one of the commissioners for negotiating peace with the mother country. His diplomatic career forms a chief chapter in the history of his country. He signed the peace Nov. 30, 1782, and now longed to return, but was not able to do so till 1785, when, after 53 years in the service of his country, he retired to private repose. Before leaving Paris he concluded the treaties with Sweden and Prussia, embodying many of his great international principles. He had been throughout the whole period of his mission an object of marked enthusiasm. His venerable age, his plain deportment, his fame as a philosopher and statesman, the charm of his conversation, his wit, his vast information, his varied aptitudes and discoveries, all secured for him not only the enthusiastic admiration of Europe, but a circle of ardent friends, embracing the very widest range of human characters. His simple costume and address, and dignified aspect, among a splendidly embroidered court, commanded the respect of all. "His virtues and renown," says Lacretelle, "negotiated for him; and before the second year of his mission had expired, no one conceived it possible to refuse fleets and armies to the countrymen of Franklin." On his return to Philadelphia (Sept. 14, 1785), he was elected "president of Pennsylvania." Washington, with whom he enjoyed an uninterrupted friendship, was among the first to welcome him. At the age of 82 he was a delegate to the convention for forming the federal constitution, and entered actively and heartily into the business of that body. He served also as president of the society for political inquiries, and wrote interesting and vigorous papers upon many important subjects. In his 84th year he wrote to Washington: "For my personal ease I should have died two years ago; but though those years have been spent in excruciating pain, I am glad to have lived them, since I can look upon our present situation." His faculties and affections were unimpaired to the last. At his funeral 20,000 persons assembled to do honor to his remains. He was interred by the side of his wife in the cemetery of Christ church. Throughout the country every species of respect was manifested to his memory; and in Europe extraordinary public testimonials are on record of honors to one of the greatest benefactors of mankind. Fault has been found with his religious character. He confesses that for a time before the age of 21 he had been a thorough deist; and it has been said that five weeks before his death he expressed a "cold approbation" of the "system of morals" of "Jesus of Nazareth." Whatever his faith and doctrine may have been, his reverence for religion and Christian institutions was constantly manifest. It was Franklin who brought forward a motion for daily prayers in the Philadel-

phia convention. The motion was rejected, as "the convention, except three or four persons, thought prayers unnecessary." We find him advising his daughter to rely more upon prayer than upon preaching; and as a practical moral adviser he has left us beautiful teachings, at least, of scarcely surpassed human wisdom. At the most critical epoch of his public life, when beset with menace, jealousy, bribery, and official caprice and injustice, he said: "My rule is to go straight forward in doing what appears to me to be right, leaving the consequences to Providence." His epitaph, written by himself many years before his death, has become famous:

"The Body
of
Benjamin Franklin, Printer,
(Like the cover of an old book,
Its contents torn out,
And strip of its lettering and gilding.)
Lies here food for worms.
Yet the work itself shall not be lost,
For it will (as he believed) appear once more
In a new
And more beautiful Edition,
Corrected and Amended
By
The Author."

Franklin was strong and well formed. His stature was 5 ft. 9 or 10 in. His complexion was light, his eyes gray. His manners were extremely winning and affable. His daughter Sarah married Richard Bache.—The last of his race who bore his name was his grandson, WILLIAM TEMPLE FRANKLIN, who died in Paris, May 25, 1828, and who published in London and Philadelphia, between 1816 and 1819, editions of his grandfather's works. The complete edition of the works of Franklin, edited by Jared Sparks, appeared in Boston in 12 vols. 8vo in 1836-'40, with notes and a life of the author. A new edition was published in Philadelphia in 1858. Franklin's autobiography, one of the most interesting works of the kind ever written, was first published in Paris in 1791, in a French translation made from a copy of the author's manuscript. This version was retranslated into English and published in London in 1793. This English version was again translated into French and published in Paris in 1798. The copy of the original autograph from which the first French version was made was published in Temple Franklin's collection of Franklin's writings in 1817. A new edition of the work, edited by John Bigelow from an original autograph which he had obtained in France, was published in Philadelphia in 1868.—See Parton's "Life and Times of Franklin" (2 vols., New York, 1864).

FRANKLIN. L. Sir John, an English naval officer and arctic explorer, born at Spilsby, Lincolnshire, April 16, 1786, died in the arctic regions, near lat. 69° 37' N., lon. 98° 4' W., June 11, 1847. He was the youngest son of a respectable yeoman, who was obliged to sell his estate and engage in trade. John was intended for the clerical profession, and received his early education at St. Ives and at the gram-

mar school of Louth. But he soon showed a decided predilection for the sea; and his father, hoping that his inclination for the life of a sailor would be removed by an experience of its discomforts, permitted him to make a voyage to Lisbon in a small merchant vessel. As he returned with his enthusiasm increased, his father yielded, and procured him admission to the navy as a midshipman at the age of 14. He served on board the *Polyphemus* at the battle of Copenhagen, April 2, 1801. In the ensuing summer he joined the *Investigator*, which was commanded by his cousin, Capt. Flinders, and was commissioned by the English government to explore the coasts of Australia. After nearly two years spent in this service, the *Investigator* proving unseaworthy, her officers sailed for home in the store ship *Porpoise*; but that vessel was wrecked Aug. 18, 1803, on a reef about 200 m. from the coast of Australia, and Franklin and his companions remained on a sand bank 600 ft. long for 50 days, when relief arrived from Port Jackson. Franklin was carried to Canton, where he obtained passage to England in a vessel of the China fleet of *Indiamen*, commanded by Sir Nathaniel Dance. On reaching England he joined the ship of the line *Bellerophon*, and in 1805 took part in the battle of Trafalgar as signal midshipman, performing his functions with distinguished courage. Of 40 persons who stood round him on the poop, only seven escaped unhurt. For several years afterward he served in the *Bedford* on various stations, the last of which was the coast of the United States during the war of 1812-'15. He commanded the boats of the *Bedford* in a fight with the American gunboats at New Orleans, one of which he boarded and captured; he was wounded, and for his gallantry was made a lieutenant. In 1818, the British government having fitted out an expedition to attempt the passage to India by crossing the polar sea to the north of Spitzbergen, Franklin was appointed to the command of the *Trent*, one of the two vessels of the expedition; the other, the *Dorothea*, being commanded by Capt. Buchan. After passing lat. 80° N. the *Dorothea* received so much damage from the ice that her immediate return to England was decided on. Franklin begged to be permitted to continue the voyage with the *Trent* alone, but Capt. Buchan would not consent. Franklin's conduct on this occasion gave him a high reputation as a bold and thorough seaman and a competent surveyor and scientific observer. In 1819 he was appointed to the command of an expedition to travel overland from Hudson bay to the Arctic ocean, and explore the coast of America eastward from the Coppermine river. (For an account of this and his other arctic expeditions, see *ARCTIC DISCOVERY*.) Franklin returned to England in 1822. Shortly after his arrival he was made a post captain and elected a fellow of the royal society. In 1823 he published "*Narrative of a Journey to the Shores of the Polar Sea in 1819-'22*;" and

in August of the same year he married Eleanor Porden. In 1825 he was appointed to the command of another overland expedition to the Arctic ocean. When the day assigned for his departure arrived, his wife was lying at the point of death. She, however, insisted that he should not delay his voyage on her account, and gave him a silk flag, which she requested him to hoist when he reached the polar sea. She died the day after he left England. He returned home by way of New York, arriving at Liverpool, Sept. 24, 1827; and on March 8, 1828, he married Jane Griffin, the present Lady Franklin. In the same year he published his "*Narrative of a Second Expedition to the Shores of the Polar Sea in 1825-'7*." In 1829 he was knighted, and received the degree of D. C. L. from Oxford university and the gold medal of the geographical society of Paris. In 1830 he was sent to the Mediterranean in command of the *Rainbow*. While on this station he was noted for his attention to the comfort of his crew, and the sailors expressed their sense of his kindness by calling his vessel the "*Celestial Rainbow*" and "*Franklin's Paradise*." In 1836 he was made governor of Tasmania or Van Diemen's Land, in which office he continued till 1843. He was a very popular governor, and originated and carried out many measures of great importance to the colony. He founded a college and gave it large endowments from his own funds, and exerted himself to have it conducted without regard to distinctions of sect. In 1838 he founded the scientific association now known as the royal society of Hobarton; during his administration its papers were printed at his expense. When the colonial legislature voted an increase to the governor's salary, Sir John refused to accept it for himself, but secured it for the benefit of his successor. Long after his departure from the colony the remembrance of his virtues drew from the inhabitants of Tasmania a contribution of £1,700, which was sent to Lady Franklin to assist in paying the expenses of the search for her missing husband. In 1845 Sir John was appointed to the command of a new expedition to discover the northwest passage. It consisted of the ships *Erebus* and *Terror*, which were fitted out in the strongest and most complete manner, and manned by picked crews, amounting, officers and men, to 138 persons. They sailed from Sheerness May 19, 1845. Franklin's orders were to return in 1847. He was last seen by a whaler in Baffin bay, July 26, 1845. In 1848, no tidings of the expedition having reached England, the anxiety of the public led to the fitting out of several expeditions in search of him. (See *ARCTIC DISCOVERY*.) After long and persistent endeavors on the part of Lady Franklin, of the British government, and of private explorers, the mystery was finally solved by the expedition of McClintock in 1859. A record then discovered made it certain that Franklin died on June 11, 1847, and that his men, some of whom long survived

him, perished one by one in their journey southward. He had reached the rank of rear admiral. In 1860 parliament voted £2,000 for a statue of Franklin, to be erected in London.—See Capt. F. L. McClintock, "Narrative of the Discovery of the Fate of Sir John Franklin" (London and Boston, 1860); Capt. S. Osborn, "The Career, Last Voyage, and Fate of Sir John Franklin" (London, 1860); also the works of Kane, Richardson, Ingfield, &c.

II. Eleanor Ann, an English poetess, first wife of the preceding, born in July, 1795. Her father, William Porden, was the architect of Eaton hall, and of other noted buildings. Almost unassisted she taught herself Greek and Latin when only 11 or 12 years old. She soon acquired several other languages, and a general knowledge of all the principal sciences, especially of botany, chemistry, and geology. At the age of 15 she began to write, and in her 17th year she produced a poem in 6 cantos, "The Veils, or the Triumphs of Constancy," which attracted considerable attention on its publication in 1815. Her next publication, "The Arctic Expedition, a Poem" (1818), led to her acquaintance with Capt. Franklin, and to their marriage in August, 1823. In 1822 her longest and best poem, "Cœur de Lion, or the Third Crusade," in 16 cantos, was published. She died of consumption, Feb. 22, 1825, the day after her husband sailed on his second expedition to the Arctic shores. Her poems, with the exception of "Cœur de Lion," were collected and published in London in 1827.

III. Lady Jane, second wife of Sir John Franklin, distinguished for the devoted perseverance with which she labored for the rescue of her husband, and for the discovery of his fate, born about 1805, died July 18, 1875. She was the second daughter of John Griffin, and was of French Huguenot descent on her mother's side. While in Tasmania she paid out of her private purse a bounty of 10 shillings each for the destruction of a dangerous species of serpent, which in consequence was soon exterminated. She expended nearly all her fortune in the search for her husband, and after the certain news of his death she continued to be identified with philanthropic and scientific plans, having been a promoter of many of the most useful public charities in England, while taking a keen interest in all schemes of foreign exploration. In February, 1872, she bought Franklin house, in Lincolnshire, intending to collect there the relics of Sir John's expeditions.

FRANKLIN, William, the last royal governor of New Jersey, an illegitimate son of Benjamin Franklin, born in Philadelphia in 1729, died in England, Nov. 17, 1813. It is not known who his mother was. About a year after his birth his father married, took the child into his house, and brought him up as his son. In childhood he was remarkably fond of books, and of an adventurous disposition. During the French war (1744-'8) he obtained a commission in the Pennsylvania forces, with which he

served in one or two campaigns on the Canadian frontier, and rose to be captain before he was of age. From 1754 to 1756 he was comptroller of the general post office, and during part of the same period was clerk of the provincial assembly. In 1757 he accompanied his father to London, where he was admitted to the bar in 1758. In 1762 he was appointed governor of New Jersey, to which province he returned the next year. In the revolutionary contest he remained loyal to Great Britain, and some of his letters containing strong expressions of tory sentiments having been intercepted, a guard was put over him in January, 1776, to prevent his escape from Perth Amboy. He gave his parole that he would not leave the province, but in June he issued a proclamation as governor of New Jersey summoning a meeting of the abrogated legislative assembly. For this he was arrested by order of the provincial congress of New Jersey and removed to Burlington. He was soon after sent to Connecticut, where he was strictly guarded for upward of two years, till in November, 1778, he was exchanged for Mr. McKinley, president of Delaware, who had fallen into the hands of the enemy. Gov. Franklin after his liberation remained in New York till August, 1782, when he sailed for England, in which country he continued to reside till his death. The English government granted him £1,800 in remuneration of his losses, and a pension of £800 per annum. William Franklin's adhesion to the royal cause led to an estrangement between him and his father, which continued after the revolutionary contest was over. Dr. Franklin bequeathed to William his lands in Nova Scotia, and released him from all debts that his executors might find to be due from him, and added this clause: "The part he acted against me in the late war, which is of public notoriety, will account for my leaving him no more of an estate he endeavored to deprive me of."

FRANKLIN, William Bael, an American soldier, born in York, Penn., Feb. 27, 1823. He graduated first in his class at West Point in 1843, and was stationed on the survey of the northern lakes. In the summer of 1845 he accompanied an expedition to the South pass of the Rocky mountains under command of Brig. Gen. Kearny, and in the following year was engaged in the survey of Ossabaw sound, Georgia. He served on the staff of Gen. Taylor at the battle of Buena Vista, and was brevetted first lieutenant for his part in it. In June, 1848, he was ordered to West Point as assistant professor of natural and experimental philosophy; and in February, 1852, he was appointed professor of natural and experimental philosophy and civil engineering at the New York city free academy. During the next eight years he was continually employed as consulting engineer and inspector on various public works, particularly harbors and lighthouses, having been engineer secretary of the lighthouse board, and superintendent of the capitol extension and

other government buildings at Washington. On May 14, 1861, he was appointed colonel of the 12th (new) regiment of infantry, and in July was assigned a brigade in Heintzelman's division of the army of N. E. Virginia. At the battle of Bull Run he was "in the hottest of the fight," according to the official report of Gen. McDowell. In August he received the commission of brigadier general of volunteers, to date from May 17, 1861. In September he was appointed to the command of a division in the army of the Potomac. Sent to reinforce Gen. McClellan after the evacuation of Yorktown, he transported his division by water to West Point on York river, and repulsed the enemy under Gens. Whiting and G. W. Smith, who attempted to prevent his landing, May 7, 1862. On the 15th he was appointed to the command of the 6th provisional army corps. During the movement to the James river, which began June 27, he was charged with covering the retreat, and repulsed the enemy on the right bank of the Chickahominy, June 27 and 28, and again in conjunction with the corps of Gen. Sumner at Savage's Station, June 29. He commanded at the battle of White Oak swamp bridge on the 30th, and the next day joined the main body of the army on the banks of the James. He was promoted to the rank of major general of volunteers July 4, and brevet brigadier general in the regular army, June 30. In the battle of South mountain, Sept. 14, he distinguished himself by storming Crampton's gap. He was in the battle of Antietam, Sept. 17, and in November was placed in command of the left grand division of the army of the Potomac, including the 1st and 6th corps, which he commanded in the battle of Fredericksburg, Dec. 13. The next year he was transferred to the department of the gulf, commanded the expedition to Sabine pass, September, 1863, and was second in command in Banks's Red river expedition, April, 1864, being wounded in the battle of Sabine cross roads. He was brevetted major general in the United States army March 13, 1865, and resigned March 15, 1866. He is now (1874) vice president and general agent of the Colt firearms manufacturing company, at Hartford, Conn., and consulting engineer of the commission for the erection of a new state house.

FRANKLINITE, a mineral composed of peroxide of iron, oxide of zinc, and oxide of manganese, in appearance much like the magnetic oxide of iron. It is found in considerable quantity only in Sussex co., N. J., although it is also mentioned as accompanying ores of zinc in amorphous masses at the mines of Altenberg (Vieille-Montagne), near Aix-la-Chapelle. The composition of the franklinite of New Jersey is:

CONSTITUENTS.	Berthier.	Thompson.	Dickinson.	Albich.
Peroxide of iron....	66.00	66.10	66.115	68.86
Oxide of zinc.....	17.00	17.48	21.771	10.81
Oxide of manganese.	16.00	14.96	11.967	18.17
Silica.....	.....	.....	0.127	.....

Its hardness is 5.5-6.5; specific gravity, 5-5.09. It occurs in large veins or beds at the mines of the New Jersey zinc company at Stirling hill and Mine hill in Sussex co., accompanied by the red oxide of zinc, lying between the crystalline limestone and the gneiss rocks. At Stirling hill it constitutes the main substance of two beds of considerable magnitude, lying in immediate contact with each other, divided only by a parting seam, running S. W. and N. E., and dipping S. E. about 40° from the hill against which the beds seem to repose, toward and under the bed of the Walkill river. The upper of these beds, lying immediately under the crystalline limestone, is composed chiefly of the red oxide of zinc with the franklinite interspersed in granular masses, often assuming the appearance of imperfect crystals. It presents a thickness varying from 3 to 8 ft., and is traced with great uniformity of structure. At times almost perfect crystals of franklinite are found, particularly where the bed comes in contact with the superincumbent limestone; these crystals are of the regular octahedral form with the edges replaced. The franklinite constitutes about 45 per cent. of the mineral contents, the rest being mainly red oxide of zinc. This bed is extensively worked for the manufacture of white oxide of zinc, which is used for paint; the residuum, after the oxide of zinc is driven off, being franklinite, is smelted into iron. The underlying bed appears on the surface or outcrop to be almost a pure massive franklinite, amorphous in structure, although occasionally also exhibiting very large and nearly perfect crystals of the franklinite; it contains no red oxide of zinc, which fact is the distinctive feature between this and the overlying bed, which is generally known as the bed of red zinc. The other locality where the franklinite is found in large masses is on Mine hill, about 1½ m. N. E. of Stirling hill, following the course of the Walkill to the village of Franklin. Here there are also found two distinct beds in immediate juxtaposition; but their relative position, as compared with that at Stirling hill, is reversed, the franklinite being the easternmost and uppermost, and the zinc being the underlying and westernmost.

FRANKS, a confederacy of German tribes, which first appeared under this name near the lower Rhine about the middle of the 3d century. It is now generally believed that the tribes which constituted the bulk of the Frankish confederacy were the same which were known to the Romans in the time of the first emperors under the names of Sigambri, Chamavi, Ampsivarii, Bructeri, Catti, &c. The first mentioned were the most powerful. A part of these tribes had passed the Rhine as early as the first half of the 1st century. In the 3d and 4th larger bodies successively passed into the N. E. part of Gaul, which country they finally wrested from the Romans in the 5th century. Under Probus they appear as dangerous enemies of the Romans. Carausius,

who was appointed to defend the province against them both by land and sea, having betrayed his master and assumed the purple in Britain, made them his allies, surrendering to them the islands of the Batavi and the country on the Scheldt. Constantius I. and Constantine the Great expelled them from this territory, but they soon invaded it again, and were finally left in its possession by Julian. From that period they appear to have formed two separate groups, the Salian (from the old German *sal*, sea, or from *Sala*, the ancient name of the river Yssel), and Ripuarian (from the Latin *ripa*, bank of a river). The former continued the attacks on Gaul during the 5th century, and established an empire under Clovis and his successors (see **FRANCO**); the latter spread southward on both sides of the Rhine, extending their conquests W. as far as the Meuse, and E. as far as the head of the Main. From them the country adjacent to the Main derives its modern name of Franconia. The Franks form an element in the modern population of France, which received its name from them, as well as of S. W. Germany. Their two divisions had separate laws, which were afterward collected in two codes, known as *Lex Salica* and *Lex Ripuariorum*.

FRANZ, Robert, a German composer, born at Halle, June 28, 1815. His parents were in moderate circumstances, and having themselves no love for music discountenanced it in their son. It was not till his 14th year that he obtained even elementary instruction in music, and that of the most imperfect kind and under every disadvantage. His passion was however so great that he was unable to follow his studies at college to any good purpose, and at last his parents were obliged to yield, and sent him for musical tuition to Schneider at Dessau. Here he learned but little, and returning to Halle was left to grope his own way. He obtained the works of Bach, Handel, and Schubert, and studied them. He now began to compose, and Schumann obtained for him a publisher for his early songs. It was at once seen that he possessed individuality of style, elevated feeling, and a happy gift of melody. His songs are several hundred in number, and in merit they rank next after Schubert's. They have obtained a great popularity in the United States as well as in Germany. He has written very valuable accompaniments for many of the arias from Handel's Italian operas that otherwise would have become obsolete; also new accompaniments to the Matthæus passion music of Bach; and so thoroughly has he imbued himself with the spirit and forms of these old masters that the new work adapts itself perfectly to the old, and restores to the world some most valuable works. Franz has always lived at Halle, in the conservatory of which he is professor. He is blind.

FRASCATI, a town of central Italy, in the province and 8 m. E. S. E. of the city of Rome, on the N. W. declivity of the Tusculan mount;

pop. about 6,000, chiefly engaged in agriculture. It was the favorite summer residence of the Roman nobility and cardinals for some centuries; and many of their magnificent villas remain. Of these the most celebrated is the villa Aldobrandini, which is adorned with numerous fountains, water works, and paintings. The villa Rufinella was once the property and abode of Lucien Bonaparte. On the summit of the mountain, 2,000 ft. above the sea, and about 2 m. from Frascati, are the ruins of Tusculum, round which clustered in the days of republican and imperial Rome the villas of her patricians, orators, and emperors.

FRASCHINI, Gaetano, an Italian vocalist, born in Pavia in 1817. He studied under Moretti, and has been distinguished in Italy since 1887, and at the Italian opera in Vienna since 1862, as a powerful and brilliant tenor singer. His greatest successes have been achieved in *Il trovatore*, *Ernani*, and *Un ballo in maschera*, which last was composed for him by Verdi.

FRASER, Alexander Campbell, a Scottish metaphysician, born at Ardochattan, Argyleshire, in September, 1819. He was educated at the university of Edinburgh, and in 1846 was appointed lecturer on mental philosophy in New college, Edinburgh. He was editor of the "North British Review" from 1850 to 1857, when he succeeded Sir William Hamilton as professor of logic and metaphysics in the university of Edinburgh, which chair he still retains (1874). He has published "Essays in Philosophy" (1856); "Rational Philosophy" (1858); "Collected Edition of the Works of Bishop Berkeley, with Dissertations and Annotations" (Oxford, 1871); and "Life and Letters of Bishop Berkeley" (Oxford, 1871). The last named work contains many of Bishop Berkeley's writings hitherto unpublished, and an account of his philosophy. Prof. Fraser has been a frequent contributor of educational, philosophical, and miscellaneous papers to the "North British Review," "Macmillan's Magazine," and other periodicals.

FRASER, Charles, an American artist, born in Charleston, S. C., Aug. 20, 1782, died there, Oct. 5, 1860. At 12 or 14 years of age he was in the habit of sketching the scenery of Charleston and its neighborhood. At the age of 16 he became a student of law. Three years later he commenced the study of art, but becoming discouraged resumed his legal studies, and in 1807 was admitted to practice. He retired at the end of 11 years with a competency, and in 1818 resumed his art, giving his attention chiefly to miniature painting, in which he attained eminent success. He painted portraits of Lafayette (1825) and of a large number of distinguished Carolinians, and also produced landscapes, interiors, historical pieces, and pictures of *genre* and still life, the greater part of which are owned in South Carolina. In 1857 an exhibition of his collected works was opened in Charleston, numbering 818 miniatures and 139 landscapes and other pieces in oil. He was

the author of "Reminiscences of Charleston," several poems and addresses, and various contributions to periodical literature.

FRASER, Simon. See LOVAT, LORD.

FRASER RIVER. See BRITISH COLUMBIA.

FRATERNITIES. See GUILD.

FRAUD. Few principles of law are oftener or more emphatically asserted than that fraud avoids every contract tainted with it, and annuls every transaction. It is seldom that this is not true; but there are certain rules and qualifications which must be known for the understanding of the practical application of the principle. Thus, fraud does not so much make the contract tainted with it void, as voidable. This is an important practical distinction, for a void contract has, and can have, no efficacy whatever, being simply nothing; whereas he who is defrauded in a contract or transaction may still be on the whole benefited by it, and he may certainly waive his right to avoid it for the fraud; and if he does so, the fraudulent party cannot insist that his own fraud has liberated him from his own engagements, and annulled his obligations. It is very difficult to give a legal definition of fraud; but it may be said to be any deception by which another person is injured. This definition leaves it necessary to explain how far such deception may be carried, and what its character must be, before the law recognizes it as fraud, and will permit a party injured by it to find legal redress, either by annulling his engagements or otherwise. For it is certain that not all deception is fraud in law. The Roman civil law used the phrase *dolus malus*, evil deceit, to express the fraud which the law dealt with. We have no similar phrase in our law, but we have an exactly similar distinction, although it is difficult to define or even to illustrate it. The law of morality and of religion is plain and simple: "Do unto others as you would have them do unto you;" and any craft or cunning, any concealment or prevarication, or consent to self-deception, by which one may make gain over another, is clearly a violation of this law. But it is certain that there is a large amount of craft, and a very cunning kind of deception, active or passive, of which the law takes no cognizance, and which characterize a very large proportion of the common transactions of society. Somewhere the law draws a line between that measure and that manner of deception against which it directs men to protect themselves by their own caution, under the penalty of suffering without remedy any mischiefs which may result from their want of skill or care, and that larger or deeper or more important kind of deception which it considers it unreasonable to require that men should guard themselves from without its aid. But where this line is drawn it would be impossible to declare by any formula. Indeed, there are whole classes of cases in which it may be considered as not yet settled what the law is in this respect. Thus, the law of warranty has

been expressly founded in England and the United States upon the rule *caveat emptor*, or, let the buyer beware; and it was once applied almost to the extent of holding that if a buyer did not choose to obtain an express warranty of the thing sold, he was remediless, whatever might be the amount of deception practised upon him, or rather whatever might be the degree or the way in which he was permitted to deceive himself. But in the article **WARRANTY** we shall show that there has been an important modification of the law in this respect.—While it is impossible to state precisely by definition what frauds the law will recognize and treat as such, and what it will not, some leading principles run through the adjudication on this subject, and may help to a just understanding of the matter. One is, that the fraud must be material to the contract or transaction, and as it were enter into its very essence and substance; and the best test of this may be found in the question, would the transaction have taken place if the fraud had not been practised? For if it would not, the fraud was material. Another is, that the fraud must work an actual and substantial injury, for mere intention or expectation is not enough. Another is, that the defrauded party must not only have believed in point of fact the false statement, but must have had a rational right to believe it, because he cannot call upon the law to protect him from the consequences of his own neglect or folly. Here the law looks carefully at the injured person's ability to protect himself; and it is far more liberal in its suppression of fraud, or in remedying its consequences, when that fraud was practised against one who from age, infirmity of mind or body, or the confidence arising from a fiduciary relation, has a right to call on the law for its protection. Another distinction which the law makes is founded on practical reasons, which amount indeed to a necessity, but is scarcely sustained by principles of morality; it is that between concealment and misrepresentation. In some branches of the law, as that of insurance, the distinction is of little value, but generally it has much force. Thus, if one buys goods on credit who is at the time insolvent, but says nothing about his affairs, the sale is valid, and the property passes to the buyer, leaving the seller only his claim for the price. But if the buyer, being insolvent, falsely represents himself to the seller as having sufficient resources to justify the sale or credit, this is a fraud which permits the seller to avoid the sale, and to reclaim the goods. (See **FALSE PRETENCES**.) The question how far one is bound to communicate to another any special facts which he knows, or indeed any information which he possesses, has often passed under adjudication. That a sale is not voidable merely because one party knew what the other did not, and bought or sold because of his better knowledge, is both certain and obvious; and perhaps it is equally certain and obvious that if the law annulled all

transactions of this kind, a very large proportion of all the buying and selling, of all that goes under the name of speculation, must come to an end. The courts of the United States have held that a buyer is not bound to communicate to a seller extrinsic circumstances which were very material to the price, and were known to the buyer alone. Still, while the law is so in general, there are cases in which the concealment of special knowledge invalidates a transaction founded upon that concealment. If one injures another by such fraud as the law recognizes, he is responsible although not interested in the transaction, and not himself gaining by the fraud; as, for example, when one knowingly gives false recommendations of a person seeking employment.—It may be proper to mention the doctrine of constructive fraud, or that by which the law treats as fraudulent certain acts which have, or which are adapted to have, the effect of fraud, although none be intended; as, for example, if one buys a chattel, and leaves it, however honestly, in the possession of the seller, this is a void sale as against a third party who buys of the seller not knowing the previous sale. This not taking away what one buys is held in some courts to be conclusive evidence of constructive fraud, and in others to be only what is called a badge of fraud, or a very suspicious circumstance indicating fraud, but open to explanation. (See SALE.)

FRAUDS, Statute of. This is a very peculiar law, and in its extent and systematic form is quite unknown out of the British empire and the United States. It originated, nearly two centuries ago, in the earnest desire of eminent English jurists to prevent the numerous frauds which were perpetrated by means of suborned and perjured witnesses; and it was thought that the more effectual way of doing this would be a provision that a large number of the most common contracts should be incapable of legal enforcement unless they were reduced to writing and signed by the party whom it was sought to charge. For this purpose, in the 29th year of Charles II. (1678), the "statute for the prevention of frauds and perjuries" was enacted; and it is commonly known by the shorter name of the "statute of frauds." It has always been doubted by wise lawyers and judges whether this statute has not caused and protected as many frauds as it has prevented. But the same reasons which led to its enactment have always produced a prevailing belief that on the whole it was useful. Hence, its provisions have been enacted more or less entirely, or declared to be law by adoption, in nearly if not quite all the states of the Union. In no one of them is the English statute verbally copied; and perhaps the provisions are not precisely the same in any two states. But they all copy parts of the original statute, and most of them enact its most material parts; and the difference between the enactments of different states is, generally speaking, not im-

portant. The reason why so many have deemed the statute useless or worse is, that it has been found impossible to make all its provisions, or even its more important ones, universally known. Hence, while by its requirement of written evidence it tends strongly to suppress that large class of frauds which was founded upon mere perjury, it tends also to expose innocent parties to grievous fraud through their ignorance of this requirement. They make, and perhaps with much care, important bargains, with all the details well adjusted; but they do not take the precaution to have their agreements reduced to writing and verified by signature; and after complying with their part of the bargain in good faith, they learn for the first time in court, or from their counsel, that their bargain gives them no legal right or remedy, because of the omission of that which they had never supposed to be requisite. We shall proceed to give the most general rules in regard to the provisions of this statute (meaning thereby both those which are most widely adopted, and those of the most important and frequent application) which have been sanctioned by the jurisprudence of the United States; without, however, attempting to go into a close consideration of the details and diversities of state enactment or adjudication.—By the fourth section of the English statute, which is the one that our statutes copy most frequently, no action can be brought upon an agreement not reduced to writing and signed by the party to be charged therewith, or by some person by him authorized, if by the action: 1, any executor or administrator is to be charged to answer damages for the deceased out of his own estate; 2, or if any person is to answer for the debt, default, or miscarriage of another; 3, or upon any agreement in consideration of marriage; 4, or upon any contract for the sale of lands, or any interest in or concerning them; 5, or any agreement not to be performed within one year from the making thereof. In reference to all these, it is held that a signing is sufficient if substantial, although not literal and formal: as if in a letter signed by the party he alludes to and recognizes the agreement; or if the party writes his name at the beginning or in any part of the agreement, with the intention that it shall verify the instrument as his own; or if a broker, for both parties or either party, writes their or his name in his book, they or he assenting. But where, as in some of our statutes, the word used is not "signed" but "subscribed," there it has been said, but may not be certain, that the name must be written at the bottom of the agreement. So the name may be printed, or written in pencil. An agent may sign, and may sign sufficiently although he write only his own name; and any ratification of his signature would be equivalent to a previous authority. But one of the contracting parties cannot sign as the agent of the other. An auctioneer or his clerk, or a broker,

may be agent for either party or both; and his entry of the name of a seller or purchaser, at the time of the sale, satisfies the requirement of the statute, unless there be some agreement or condition to the contrary. The written agreement need not be in any precise or regular form, but must contain all the substantial elements of the bargain. In England, and in some of our states, it must recite the consideration of the contract, while in others, if the promise be in writing and signed, the consideration may be proved by other evidence. The agreement may be contained in letters, and written on several pieces of paper, if they are such that they can be read together consistently with their purpose and character. And if a contract be severable in its own nature, and in some of its parts the statutory requirement is satisfied and in some not, the contract is still enforceable for those parts which comply with the statute. If a written contract be sued, it may be shown in defence that it has been altered. But if a plaintiff rests upon his written contract, but can maintain his action by it only by showing that it was orally altered, it is no longer the written contract on which he rests, and the action is defeated. Of the special clauses, the second, relating to a promise "to answer for the debt, default, or miscarriage of another," makes this statute cover all guaranties; and it is of great importance in respect to them. But it will be more convenient to state the law in this behalf under the title GUARANTY. The third clause, which relates to promises "in consideration of marriage," is held not to apply to a promise or contract to marry, but to all promises of settlement, advancement, or other provision in view of marriage, and therefore all these must be in writing and signed. And it must be a promise to the other party; thus a promise of an advancement made to a daughter, in writing, not known to the intended husband until after the marriage, is not a promise to him and cannot be enforced by him. The fourth clause relates to any promise or contract for "the sale of lands, tenements, or hereditaments, or any interest in or concerning them." The very broad scope of this phraseology has been considerably curtailed by adjudication. Thus, a contract for the sale of growing crops may be within the requirement of the statute or without it, according to circumstances. If the crop is already reaped, it is certainly severed from the land, and is of course a mere chattel; but even if it be still growing, if the intention of the parties be to reap it when grown and remove it at once from the land, this is not held to be a contract for a sale of an interest in lands; and the same rule was applied to a sale of mulberry trees in a nursery. While there is some uncertainty in the cases, we think the same rule of construction applies to growing grass, trees, or fruits, making writing unnecessary for the enforcement of a contract respecting them; at least, if the seller

himself is to sever and deliver them. A mere license to use land for some special purpose, as to stack hay, or leave a wagon on it for a short time, is not a bargain for an interest in lands. But a contract to convey lands for certain services is within the statute; and if it be not in writing, and the services be rendered, the party rendering them cannot enforce the contract or have the lands; but he may sue for the value of his services, and in determining that value the value of the lands may be taken into consideration. The fifth clause relates to an agreement "that is not to be performed within one year from the making thereof." Here the important principle has become well settled that a contract or agreement is not within the statute, and therefore need not be in writing, if it be in reality and in good faith capable of a full and substantial performance within one year, unless extraordinary circumstances interfere to prevent it; and this principle is applied even where the parties themselves do not contemplate any performance of the contract within a year from the making of it. Thus, if one agrees to work for another "for one year," no time for the beginning of the service being fixed, he has a right to begin instantly, and then all his service will be rendered within the year, and the contract need not be in writing. It is important to remember, that if a contract which should have been in writing, but is not, is wholly performed on one side, and is such that nothing remains but the payment of the consideration money, there are many cases in which an action may be maintained in some form for the money due.—Another section (the 17th of the English statute) enacts that "no contract for the sale of any goods, wares, or merchandises, for the price of £10 or upward, shall be good, except the buyer shall accept part of the goods so sold and actually receive the same, or give something by way of earnest to bind the bargain, or in part payment," or that some note or memorandum be signed as before. This provision, in some form or other, is very common in the United States. The sum is variously fixed, in different states, at about \$80 to \$50, rarely less or more. The principal questions which have arisen under this clause are, what delivery and acceptance, or what earnest, or what part payment, will satisfy the statute, so as to make the writing unnecessary. In the first place, there must be both delivery and acceptance. A meets B, and they agree orally that A shall buy 100 bales of cotton which B has for sale for \$25,000. B sends the cotton forthwith to A's store. This, according to common law, completes the sale and B's right to demand the price. But by the statute of frauds, if there be no note or memorandum in writing signed by A, he may instantly, and without assigning any reason, send all the cotton back to B. As to what is a delivery, it may be said, in general, that it is any transfer of possession and control, made by the seller, for the purpose and with the effect of

putting the goods out of his hands and into the hands of the buyer. It may be an actual delivery; or it may be constructive, as by the delivery of the key of a warehouse, or making an entry in the books of the warehouse keeper, or the delivery of an indorsed bill of lading, or even pointing out as the buyer's own massy goods that are difficult of removal, as timber in a dock, or a large stack of hay. So a part may be delivered for the whole, and carry with it constructively the delivery of the whole. On the other hand, as to what constitutes acceptance, we must look mainly at the intention of the party; for if he so acts as to manifest his assent to the delivery, and his intention to accept and retain the goods, or so as to justify the seller in believing that the buyer so assents and intends, this will have the effect of fixing his liability for the price, whatever be the way in which he expresses this assent and intention. Hence, mere delay, or holding the goods for a considerable time in silence, is an assent and acceptance. But as he has a right to examine the goods and see whether he chooses to accept them, he must be allowed time enough for this purpose; and his silence during a period of time that is not more than sufficient for this is not evidence of acceptance. It has been much questioned whether the sale of shares or stocks in incorporated companies, as, for example, in corporations for manufacturing purposes, for railroads, and the like, is a sale of "goods, wares, and merchandises," within the meaning and operation of the statute. In England the prevailing authority is that these shares are not "goods, wares, or merchandises" within the statute, and therefore the bargain need not be in writing. Perhaps the prevailing rule in the United States is the other way. But the authorities are to some extent conflicting, and the question may not be considered settled. As to giving something by way of earnest (the exact words of the English statute are "in earnest"), almost anything which has an actual value, though a small one, may suffice. Thus, a dime, or even a cent, might be sufficient, but not a straw or a chip, though it were called "earnest money;" it would be safe, however, if earnest were relied upon as clinching the bargain (to use an old phrase), to give money of some real and considerable value. So, part payment has the same effect as earnest money; but it must be an actual part payment. Therefore, if the seller owes the buyer, and it is a part of the bargain that the debt shall be discharged and be considered as a part of the price to be paid, the contract must nevertheless be in writing, because this is not a part payment within the meaning and requirement of the statute. If, however, the debt were certainly and irrevocably discharged, as by the giving up of a note of hand, the decision might be otherwise. The difficult question has been much considered whether a bargain that A should make and sell a certain article to B is a contract for the sale of the thing, which must

be in writing, or a mere bargain whereby B hires A to work for him in a certain way, which need not be in writing. Perhaps no better rule or principle for deciding this question can be found than the following: A contract to buy a thing presently, which the seller has not now, is just as much within the requirement of the statute as a bargain for a present sale; and if by the bargain the seller may himself buy, or make, or procure in any way he likes, the thing he agrees to sell, this is only a contract for the sale of the goods, and must be in writing. But if the seller, and he alone, is by the bargain to manufacture these, and in a certain way, and of certain materials, or after a certain model, or if in any way it appears that the seller is to make certain things and charge therefor a price for his labor, skill, and material, although all these are included in the mere sale price of the article, then it is a contract for the manufacture of the goods, and not merely a contract for their sale, and it need not be in writing. The statute itself, both in England and the United States, speaks of part payment only; but courts of equity, both there and here, have strongly inclined to the rule that part performance of any of the contracts within the statute of frauds shall have the same effect that part payment has upon a contract of sale by the statute. Some doubt has been expressed as to the expediency of the rule; but it may now be considered settled that courts of equity, or courts of law having equity powers (as most American courts of law now have), will enforce an oral contract which should have been in writing, provided there has been an actual and substantial part performance of it by the party sought to be charged.—In regard to other sections of the English and some of the American statutes of frauds, or analogous statutes, see *LEASE, TRUSTS, and WILL*.

FRAUENBURG, a town of Prussia, in the province of East Prussia, 41 m. S. W. of Königsberg, on the Frische Haff, and at the mouth of the Baude; pop. about 4,000. It is the seat of the Catholic bishop of Ermeland. The cathedral, which is on an elevation, has six towers, and with its surroundings constitutes a kind of fortress; it contains the tomb of Copernicus, who in 1543 died here.

FRAUENFELD, a town of Switzerland, capital of the canton of Thurgau, on the Murg, an affluent of the Thur, 23 m. N. E. of Zürich; pop. in 1870, 5,138, most of whom belong to the Reformed church. It has a cantonal school, which was founded in 1853, and consists of a gymnasium and an industrial establishment.

FRAUENSTÄDT, Christian Martin Julius, a German philosopher, born at Bojanowo, in Posen, April 17, 1813. He studied in Berlin, was tutor in the family of Baron Meyendorff in 1841-'4, and next in that of Prince Sayn-Wittgenstein in Russia till 1846. Since 1848 he has resided in Berlin. He was at first to some extent an adherent of Hegel, the influence of whose doctrines is apparent in his works *Ueber*

das wahre Verhältniss der Vernunft zur Offenbarung (1848), *Aesthetische Fragen* (1853), &c. He afterward made the acquaintance of Schopenhauer and became his most distinguished follower. Among his subsequent works are: *Ueber die Naturwissenschaft, &c.* (1855); *Der Materialismus* (1856); *Das sittliche Leben, ethische Studien* (Leipsic, 1868); and *Blicke in die intellektuelle, physische und moralische Welt* (1869). He published several works relating to Schopenhauer and to his literary remains (1861-'4), and edited his complete works (6 vols., Leipsic, 1874).

FRAUNHOFER, Joseph von, a German optician, born in Straubing, Bavaria, March 6, 1787, died June 7, 1826. The son of a glazier, he exercised in boyhood the trade of his father. In the intervals of labor he studied the laws of optics, made himself familiar with mathematics and astronomy, and in 1806 became technical director of the mathematical institute at Munich. He afterward united with Reichenbach and Utzschneider in founding at Benedict-Beuren an establishment for the fabrication of dioptric instruments, which was transferred to Munich in 1819. He manufactured the finest crown glass, much superior to the English, for achromatic telescopes and prisms, and invented a machine for polishing surfaces in parabolic segments, a heliometer, a microscope, and the celebrated parallactic telescope of the observatory of Dorpat. By using fine prisms that were free from veins he discovered about 590 black lines crossing the solar spectrum, and projected the most important of these in a drawing of the spectrum. Similar lines he found in the spectra of the moon and of some of the planets and fixed stars, but none in artificial white lights. (See SPECTRUM ANALYSIS.)

FRAUSTADT, a town of Prussia, in the province of Posen, 7 m. from the frontier of Silesia, and 14 N. E. of Glogau; pop. in 1871, 6,515. It has a convent, an orphan house, a *Realschule* of the first class, and manufactures chiefly of woollen and linen cloth. In 1706 the Swedes, under Charles XII.'s general Rehnskjoeld, obtained here a victory over the united Saxons and Russians.

FRAYSSINOUS, Denis Luc, a French prelate and statesman, born at Curières, in the district of Rouergue, May 9, 1765, died at St. Géniez, Dec. 12, 1841. He studied theology at Paris, was admitted to orders in 1789, retired to Rouergue during the revolutionary persecution, and began at Paris in 1803 the public lectures upon the proofs of Christianity which were the basis of his reputation. His eloquence and genius attracted the cultivated youth of the capital, and operated effectively against the reigning philosophy. When in 1809 the French empire came into collision with the holy see, his lectures were interrupted, and in 1811 he again retired to Rouergue, and returned only with the Bourbons. In October, 1814, he resumed his conferences, and was made successively royal preacher, bishop of

Hermopolis *in partibus*, grand master of the university (1822), member of the French academy, peer of France, and minister of ecclesiastical affairs and public instruction (1824). He recalled the Jesuits into the schools and churches. In 1830 he was intrusted by Charles X. with the education of the duke of Bordeaux, whom he soon after accompanied into exile. He returned to France in 1838, after which he lived in retirement. His principal works are funeral orations on the prince of Condé, Cardinal Talleyrand, and Louis XVIII.; *Les vrais principes de l'Eglise gallicane, &c.* (1818); and a collection of his conferences under the title of *Défense du Christianisme* (3 vols.), of which 15 editions appeared between 1825 and 1843, and which was translated into many languages.

FREDEGONDA, a Frankish queen, the rival of the famous Brunehaut, born about 545, died in 597. She was maid of honor to Audovera, queen of Chilperic I. of Neustria, and the king being captivated by her beauty made her his concubine. She contrived by a trick the repudiation of the queen, but was disappointed by the marriage of Chilperic with Galsuinda, a Visigoth princess and sister of Brunehaut, or Bruneilde, who had been married to his brother Sigebert, king of Austrasia. Attributing this marriage to the influence of the Austrasian queen, Fredegonda vowed deadly hatred to both sisters. She removed Galsuinda by assassination, became her successor, and brought about a war of the two brothers, in which Sigebert was victorious, but soon fell by the hands of her assassins (575). Brunehaut, who became her captive, escaped death and returned to her own country; but Merovens, the son of Chilperic by his first wife, who had been secretly married to her, fell a victim to the revenge of his stepmother. A series of atrocious crimes followed. Pretextatus was treacherously murdered; Clovis, the brother of Merovens, was executed on the false accusation of having caused the death of Fredegonda's three children; the mother of the princes was strangled, their sister outraged and confined in a convent. Finally, she contrived the assassination of her husband, and assumed the government in the name of her son Clotaire. She now successfully resumed the war against Austrasia, and remained in power till her death.

FREDERICA. See FRIDERICIA.

FREDERICK. I. A N. county of Maryland, bordering on Pennsylvania, and separated from Virginia on the S. W. by the Potomac river; area about 770 sq. m.; pop. in 1870, 47,572, of whom 7,572 were colored. A branch of the Blue Ridge of Virginia, called South mountain, runs along its W. border, but most of the land in the central and E. parts is undulating. The soil is fertile and well watered by the Monocacy river, Cotoctin, Pipe, Linganore, and Bennett's creeks. Copper, iron, manganese, excellent limestone, and fine white marble are among the mineral products. The county is traversed by the Baltimore and Ohio

and the Western Maryland railroads, and has on its S. W. border the Potomac river and the Ohio and Chesapeake canal. The chief productions in 1870 were 1,133,623 bushels of wheat, 54,995 of rye, 1,860,420 of corn, 250,069 of oats, 138,484 of potatoes, 32,898 tons of hay, 877,784 lbs. of butter, 34,533 of wool, and 274,369 of tobacco. There were 11,860 horses, 11,907 milch cows, 10,188 other cattle, 9,817 sheep, and 29,989 swine; 16 manufactories of carriages and wagons, 1 of charcoal, 15 of clothing, 25 of barrels and casks, 2 of fertilizers, 15 of furniture, 6 of lime, 16 of saddlery and harness, 3 of sashes, doors, and blinds, 11 of tin, copper, and sheet-iron ware, 10 of cigars, 8 of woollen goods, 4 of bricks, 47 flour mills, 4 iron works, 21 tanneries, 10 currying establishments, and 2 distilleries. Capital, Frederick. II. A N. county of Virginia, bounded N. E. and W. by West Virginia; area, 378 sq. m.; pop. in 1870, 16,596, of whom 2,733 were colored. It occupies part of the great valley of Virginia, is highly productive, and abounds in fine mountain scenery. Two or three small affluents of the Potomac supply it with good water power. The Winchester, Potomac, and Strasburg railroad passes through the county. The chief productions in 1870 were 239,698 bushels of wheat, 182,672 of Indian corn, 76,743 of oats, 22,661 of potatoes, 8,725 tons of hay, 230,178 lbs. of butter, and 26,928 of wool. There were 3,990 horses, 3,405 milch cows, 4,122 other cattle, 6,641 sheep, and 6,702 swine; 7 manufactories of carriages and wagons, 3 of gloves, 2 of stoves, &c., 1 of ground sumach, 7 of woollen goods, and 19 flour mills. Capital, Winchester.

FREDERICK, a city and the capital of Frederick co., Maryland, situated on Carroll's creek, 2 m. from its mouth in Monocacy river, about 40 m. W. by N. of Baltimore; pop. in 1850, 6,028; in 1860, 8,143; in 1870, 8,526, of whom 1,822 were colored. It is a well built city, with wide regular streets, lined with houses of brick or stone. A branch railroad 3 m. long connects it with the Baltimore and Ohio railroad. It has an extensive trade, and important manufactures of iron, wool, paper, flour, leather, &c. There are four national banks, with an aggregate capital of \$575,000; a savings bank, with \$217,231 capital; three weekly newspapers, and 10 or 12 churches. The city is the seat of several important educational and religious institutions. Frederick college, established by the state in 1797, in 1872 had 3 professors, 109 students, and a library of 2,300 volumes. Frederick female seminary, established in 1842, had 8 instructors, 81 students, and a library of 1,000 volumes. The convent of the Visitation nuns has an academy and a library of 1,000 volumes, and the house for novices of the society of Jesus 1,100 volumes. A state institution for the education of the deaf and dumb was organized here in 1867, which in 1872 had 9 instructors, 97 pupils, and a library of 2,000 volumes.

FREDERICK, the name of several monarchs and princes, arranged below under their respective countries in alphabetical order:

I. BADEN.

FREDERICK I., grand duke, born Sept. 9, 1826. The second son of the grand duke Leopold, he became regent for his brother, who was bodily and intellectually infirm, April 24, 1852, succeeded as grand duke Sept. 5, 1856, and married in the same year a daughter of the present emperor of Germany. He is distinguished by his enlightened views of civil and religious government. At the gathering of princes at Frankfort in 1868 he opposed the plans of Austria, and urged the supremacy of Prussia. He was nevertheless constrained, together with the other states of south Germany, to side with Austria in the war of 1866, but subsequently he readily and closely allied himself with the North German confederation. During the Franco-German war he went to Versailles, and strenuously exerted himself in favor of the formation of the German empire and the imperial constitution.

II. BOHEMIA.

FREDERICK, elector palatine (V.) and king of Bohemia, born in Amberg in 1596, died in Mentz, Nov. 19, 1632. He was the son of the elector Frederick IV., and by his mother grandson of William I. of Orange. He received a careful education, succeeded his father in the palatinate in 1610 as a minor, married Elizabeth, daughter of James I. of England, became the leader of the Protestant union, and in the second year of the thirty years' war (1619) was elected king of Bohemia by the revolted people. Induced by his ambitious wife, he accepted the regal crown, which he soon after lost through the battle of Prague (Nov. 8, 1620), rapidly won by his cousin Maximilian of Bavaria, the head of the Catholic league. Frederick hastily escaped to Holland, and lived in exile, under the ban of the empire and persecuted by ridicule.

III. DENMARK.

FREDERICK VI., king of Denmark, son of Christian VII. and the princess Caroline Matilda, born Jan. 28, 1768, died Dec. 3, 1839. He was declared regent at the age of 16. His education had been much neglected, but he had great natural intelligence, firmness, and a capacity for observation. With the help of his minister Count Bernstorff he applied himself to the abolition of feudal serfdom in Denmark (which in 1804 he also effected in Schleswig-Holstein), the reformation of the criminal code, the breaking up of monopolies, the establishment of a better financial system, the removal of the disabilities of the Jews, and the earliest prohibition of the slave trade. March 16, 1792, was the date of the edict against the slave trade, providing for its enforcement on and after Jan. 1, 1804. Bernstorff, who died in 1797, had recommended to the regent to observe a strict

neutrality in the wars of the epoch, but this soon became impossible. In 1800 the regent concluded a convention with England, whose claim of right to search Danish merchantmen for goods contraband of war had led to much recrimination, and even some acts of open hostility. But in December, 1800, Denmark having signed the maritime confederacy with Russia, Sweden, and Prussia, on terms similar to the armed neutrality of 1780, war broke out afresh. Every Danish vessel in English ports was seized on Jan. 14, 1801. On March 20 Sir Hyde Parker, with Nelson second in command, entered the Cattegat with a fleet of 47 vessels, 18 of which were line-of-battle ships. The regent was summoned to withdraw from the neutral convention, and to open his ports to the English. The demand was rejected, and a furious engagement followed, in which the Danish fleet was almost annihilated (April 2). An armistice was now concluded for 14 weeks, and this was soon followed by a peace, the confederacy having been broken up in consequence of the assassination of the czar Paul. Frederick, however, persisted in the policy of neutrality, and on Aug. 8, 1807, a British fleet appeared off Copenhagen. The prince was summoned to an alliance with England, and to surrender his fleet, his capital, and his castle at Elsinore. On his refusal, the capital was bombarded for three days (Sept. 2-5). A capitulation was then made, the fleet was transferred to a British admiral, the arsenal and docks were destroyed, and every ship and boat, as well as every available piece of timber, rope, or shipwright's tool, was carried to England. Denmark threw herself at once into the arms of France, and sent forth a fleet of privateers which preyed incessantly upon British commerce. The father of the Danish regent, the unhappy Christian VII., died March 13, 1808, and Frederick ascended the throne. He had married in 1790 the daughter of the landgrave of Hesse-Cassel. On Dec. 10, 1809, Sweden signed away Finland to Russia; and in the course of the following month a treaty was concluded by Denmark with Sweden which was designed to reestablish the good relations of the two countries. Both were exhausted by the wars of their great neighbors, and both soon became subject to the will of Napoleon. Denmark remained his faithful ally, and suffered accordingly. In 1814 she was robbed of Norway, in exchange for which she received Pomerania, which she afterward ceded to Prussia. Frederick was at last compelled to send 10,000 men to the allied army against the French emperor. The kingdom had become bankrupt in 1813. The peace brought with it an immense fall in the price of provisions; and real estate remained at a great depreciation of value as late as 1826. The wisdom and devotion of the king gradually brought about improvement in general affairs. A national bank was reestablished. The farmers were allowed to pay their taxes in kind. Order was restored to the finances, and confidence returned. The

last part of Frederick's reign is remarkable for the establishment of a representative council as a popular branch of the government (May 28, 1831), which was received by his subjects with every demonstration of joy.

FREDERICK VII., king of Denmark, son and successor of Christian VIII., born in Copenhagen, Oct. 6, 1808, ascended the throne Jan. 20, 1848, died at Glücksburg, Nov. 15, 1863. His mother was the princess Charlotte Frederike of Mecklenburg-Schwerin. From 1826 to 1828 he travelled in various parts of Europe, and studied in Geneva. He married on Nov. 1, 1828, the princess Wilhelmina Maria of Denmark, whom he divorced in 1837; and in the same year he was removed by royal order to Fredericia in Jutland. His exile ended with his father's accession to the throne in 1839, when he was appointed governor of Fünen and member of the council of state. In June, 1841, he married the princess Caroline Charlotte Marianne of Mecklenburg-Strelitz, whom he also put away in September, 1846; and in August, 1850, he contracted a morganatic marriage with a milliner of Copenhagen whom he had created Countess Danner in 1848. The principal events of his reign are the revolt of Schleswig-Holstein in 1848, and the subsequent war, and the abolition of the Sound dues in 1857, for an account of which see **DENMARK**. After the restoration of peace he left the control of the government in the hands of the ministry, and devoted himself to his favorite study of archæology. While yet crown prince he was president of the royal archæological society, which place he held till his death. He published a number of works on that subject, among them *Ueber den Bau der Riesenbetten der Vorzeit* (1857.) With his death the elder line of the royal house of Oldenburg became extinct. His equestrian statue was unveiled at Copenhagen on Oct. 7, 1873.

IV. GERMANY.

FREDERICK I., emperor of Germany, surnamed Barbarossa (Redbeard), son of Duke Frederick II. of Swabia, and Judith, daughter of Henry the Black, duke of Bavaria, born in 1121, drowned in Asia Minor, June 10, 1190. His uncle, Conrad III., the first German emperor of the house of Swabia (Hohenstaufen), had so entirely won the confidence of the princes and nobles of both Italy and Germany, that upon his recommendation Frederick, then duke of Swabia, was unanimously elected his successor (1152). After reducing several revolted Italian cities and receiving the crown of Italy at Pavia, he went to Rome, reestablished the pope's supremacy there, which had been shaken by Arnold of Brescia, and was crowned emperor, but not until the pope (Adrian IV.) had obliged him to perform several humiliating ceremonies. His next care was to pacify the empire by settling the disputes between the archbishop of Mentz and the count palatine of the Rhine, and the difficulties concerning the

duchy of Bavaria. He reduced Boleslas of Poland to vassalage, and in six years had restored the empire to the prosperity which it enjoyed under Henry III. He now turned his attention again to Italy, where the smaller towns were oppressed by Milan, and in 1158 he appeared before that city with 115,000 troops and forced it to submission. Crema was destroyed after a terrible siege (1160). Milan soon rebelled again, and its fortifications were destroyed and its inhabitants exiled. Meanwhile Pope Adrian had died (1159), and Alexander III. been chosen to succeed him. Frederick supported an antipope, Victor V. (or IV.), and Alexander fled to France. Victor died in 1164, and the emperor thereupon set up another antipope, who took the name of Pascal III., and crowned the emperor and his consort a second time in the church of St. Peter at Rome in 1167. The Lombard cities had formed a powerful league against Frederick, and a terrible pestilence which broke out in his army forced him to return to Germany in disguise, with only a few followers. The defences of Milan were then restored, and a new city sprang up in a beautiful and naturally fortified spot, which in honor of the pope and in defiance of the emperor was called Alexandria or Alessandria. During this time Frederick was busily engaged in regulating the affairs of Germany and strengthening his own power. In the autumn of 1174 he invested Alessandria, and besieged it for five months, during which his army suffered greatly. The Lombards came to the relief of the city, and on May 29, 1176, a decisive battle was fought near Legnano, in the vicinity of the lake of Como, in which Frederick was defeated with great loss, and was supposed for some days to have been killed. He reappeared at Pavia, where the empress had already put on mourning, acknowledged Alexander as pope, and in July, 1177, held an interview with him at Venice, in which a complete reconciliation was effected, Frederick humbling himself again at the pope's feet, and receiving from him the kiss of peace. The cities of Lombardy obtained a truce for six years. New troubles were now raised in Germany by the ambitious duke Henry the Lion. He was finally subdued, and banished for three years. The Lombard truce was followed in 1183 by a definitive treaty of peace on terms honorable to all parties, and when Frederick made a journey to Italy soon afterward he was received with acclamations of joy. Tranquillity reigned in all his dominions when the news of the fall of Jerusalem in 1187 caused Pope Clement III. to proclaim the third crusade. The old emperor took the cross, and in the spring of 1189 put himself at the head of 150,000 warriors, crossed Hungary, severely punished the Greeks, whom he suspected of treachery, penetrated into Asia Minor, defeated the Moslems in several engagements, and took Iconium (Konia). The army reached the banks of the Seleph or Calycadnus in Cilicia, June 10, 1190. The vanguard had crossed

by a bridge, when the emperor, impatient to join his son, Duke Frederick of Swabia, who led the advance, plunged with his war horse and heavy armor into the stream, was overpowered by the current, and was borne away. Some historians have preferred a less well authenticated account that he lost his life in consequence of bathing, like Alexander, in the Cydnus. Frederick was a man of noble qualities, of great mental endowments, and of spirit equal alike in reverses and prosperity, though somewhat arrogant and not seldom cruel in the heat of war. He was a patron of letters and a man of learned accomplishments, and remarkable for elegance and majesty of aspect. He wrote memoirs of some parts of his life, which he left to Otho, bishop of Freising. After divorcing his first wife (1156), he married Beatrice of Burgundy. His son Frederick, founder of the Teutonic knights, lost his life in the third crusade, and another son, Henry VI., succeeded to the empire.

FREDERICK II., a German emperor and king of Naples and Sicily, grandson of the preceding and son of Henry VI. and Constantia of Sicily, born at Jesi, near Ancona, Dec. 26, 1194, died at Fiorentino or at Fiorenzuola, Dec. 13, 1250. He was carefully educated by his mother under the guardianship of Pope Innocent III., acquired an extensive knowledge of ancient and modern languages, and of different sciences, including philosophy, which he learned from a Saracen teacher, and poetry, which he cultivated himself, and soon developed those chivalric and royal talents, that active, energetic, and buoyant spirit, which made him one of the most distinguished monarchs of the middle ages. He was hereditary duke of Swabia and other dominions in Germany, but for his investiture and coronation as king of Naples and Sicily his mother sacrificed to Innocent III. (1209) some of the most essential rights of the state. His uncle, Philip of Swabia, who disputed the throne of Germany after the death of Henry VI. with Otho IV., having fallen in battle, Frederick was assisted by the pope to reestablish the imperial dignity of his house. He went to Germany in 1212, was joyfully received by the Ghibellines, compelled Otho to retire, was crowned at Aix-la-Chapelle in 1215, and generally acknowledged in 1218. Leaving his son Henry, whom he caused to be declared king of the Romans, in Germany, he started in 1220 for Italy, hastened to Rome, where he was crowned as emperor, and thence to his hereditary kingdom, whose affairs he arranged while preparing for a crusade, according to a solemn promise given to the see of Rome. Men of science, poets, and artists flocked to his court, the university of Naples was founded, the medical school of Salerno became flourishing, collections of art were procured, and Peter de Vineia prepared an extensive code of laws to suit all the classes and nations of Germany and Italy, which Frederick was scheming to unite into one hereditary empire. These

schemes were checked by the independent spirit of the Lombard cities, and by the opposition of the popes Honorius III. and Gregory IX., who finally compelled the emperor, by threats of excommunication, to start upon his long delayed crusade (1227). But a pestilential disease which broke out on board the fleet obliged him to land at Otranto, where the greater part of the pilgrims dispersed. The expedition only reached the Morea, and Gregory punished the emperor with excommunication and interdict. It was in vain that Frederick started again the next year, reached the Holy Land, and fought successfully against the Mussulmans; the policy of the pope, who declared him unworthy before absolution to battle for the cross, roused against him the patriarch of Jerusalem and the three orders of knights in the East, and also induced his father-in-law, John of Brienne, titular king of Jerusalem and emperor of Constantinople, to invade the Italian kingdom. Having concluded a truce of ten years with the sultan of Egypt, which brought into his possession the holy cities and the whole coast of Judea, he returned as crowned king of Jerusalem, reconquered his kingdom, defeated the intrigues of his enemies, and finally gained his absolution (1230). The Lombard cities still maintained their league, being now supported by the rebellion of Henry, the son of the emperor. Frederick returned to Germany after an absence of 15 years, restored his imperial dignity, and pardoned his son. But a new rebellion drew upon the prince the punishment of imprisonment for life, in the seventh year of which he died. His younger brother Conrad was made king of the Romans in his stead, and Frederick marched against the Lombards, and defeated them at Cortenuova (Nov. 26-27, 1237); all the cities surrendered except Milan, Brescia, Piacenza, and Bologna, whose resistance was again encouraged by Gregory IX. Irritated by Frederick's having made his natural son Enzo king of Sardinia, the pope again excommunicated the emperor on Palm Sunday, 1239. Frederick marched against Rome, took Ravenna, and had the Genoese fleet, which was conveying 100 prelates to Rome, intercepted by Enzo (1241). Gregory IX. did not long survive these reverses. The short papacy of Celestine IV. and a long interregnum followed, which was terminated by the election of Innocent IV. The new pope, once the friend of the emperor, became his bitterest enemy, confirmed his excommunication, fled to Lyons in France, where he convoked a council, cited Frederick before this tribunal, rejected his defender Thaddeus of Suessa, declared the throne of Germany vacant, and subsequently recognized two new emperors, Henry Raspe of Thuringia, who was defeated by Conrad, and William of Holland. The emperor, deserted by many of his allies, lost a battle before Parma, and another near Bologna, in which Enzo was made prisoner. But he continued the struggle until he died.

FREDERICK III., king of Germany. See LOUIS IV., THE BAVARIAN.

FREDERICK III., surnamed the Pacific, fourth emperor of Germany of the house of Hapsburg (Frederick IV. as king of Germany, and V. as archduke of Austria), son of Duke Ernest of Styria and a Polish princess, born in Innspruck, Sept. 21, 1415, died in Linz, Aug. 19, 1493. He began his reign over Styria, Carinthia, and Carniola, together with his brother Albert the Prodigal, in 1435, became after the death of the emperor Albert II. (1439) guardian of his son Ladislas the Posthumous, and was unanimously elected to the throne of Germany in 1440, and crowned at Aix-la-Chapelle in 1442. Possessed of many private virtues, he was nevertheless inadequate to the task of ruling the German empire in that period of anarchical turbulence, or even of defending the interests of his house against the attacks of the warlike and ambitious Matthias Corvinus, king of Hungary, George Podiebrad of Bohemia, and Charles the Bold of Burgundy. The only weapon he seems to have wielded with dexterity was diplomacy, but this, too, served only the private purposes of the house of Austria, of which he may be regarded as the second founder. Wars, however, in which his part was generally passive, filled nearly the whole reign of this peace-loving monarch, which was the longest of any German emperor's, lasting for 53 years. His brother Albert, duke of Upper Austria, repeatedly attacked him; the Hungarians under John Hunyady invaded Austria (1445-52); the Armagnacs, whom the emperor had called to aid him against the Swiss, committed depredations (1445); Matthias Corvinus and George Podiebrad defeated the imperial forces; the Turks ravaged Carniola (1469); hostilities broke out with Charles the Bold of Burgundy, and a war was carried on in the Netherlands, which Maximilian, the son of Frederick, had received after the death of Charles the Bold (1477) with the hand of his daughter Mary, and where he was made captive in 1488. Frederick was also humiliated by the usurpation of Sforza at Milan (1447), after the death of the last Visconti; by the Swiss, who routed the Armagnacs, and compelled him to an unfavorable treaty (1449); in the quarrel of the succession of the Palatinate (1449), which threatened to cost him his throne; by continual lawlessness in Germany, where he was once cited before the secret tribunal of the *Vehme*; and by the successive encroachments of the popes, particularly of Pius II. (once his secretary as *Æneas Sylvius*). His chief efforts to avert the invasion of the Turks were a journey to Rome for a conference with the pope (1468), and the convening of a diet at Ratisbon (1471), both without result. In 1485 Frederick had a new quarrel with Matthias, who wrested from him Vienna and all Lower Austria. On the death of Matthias (1490), Frederick regained these possessions, and his last years were cheered by the successes of his son

Maximilian, whom he had made king of Rome (1486), and finally intrusted with all the cares of his dominion (1490), himself retiring to Linz, where he was engaged in his favorite studies of astrology, alchemy, and botany till the end of his life. He was the last king of Germany who was crowned emperor of Rome and king of the Lombards. Having inherited Lower Austria on the death of Ladislas, and Upper Austria on that of his brother Albert, he raised these united provinces to the dignity of an archduchy. The crown of Germany became nearly hereditary in his house, the next successor being his son Maximilian I. His device is said to have been *A. E. I. O. U.: Austria est imperare orbi universo*. A collection of his sayings was published under the title of *Margarita Facetiarum* (Strasburg, 1509).

V. HESSE-CASSEL.

FREDERICK WILLIAM, elector of Hesse-Cassel, born Aug. 20, 1802, died Jan. 6, 1875. He succeeded to the electorate Nov. 20, 1847. Although his mother was a daughter of King Frederick William II. of Prussia, he joined Austria in 1866; and as he declined to remain neutral in the war between that state and Prussia, or to accept the proposals of the latter for a reform of the German diet, a Prussian army invaded his territory (June 16), and he was arrested (June 28) and detained in the castle of Stettin. Despite the annexation of his electorate to Prussia with the consent of Austria, he would not relinquish his rights as a sovereign prince until Sept. 17, 1867, when he agreed to abdicate, on condition of receiving a life interest in the electoral crown domain, besides a sum of 600,000 thalers and the privilege of inhabiting the palaces in the province of Hanau. After his release he resided on his estates in Bohemia and in the palace of Prince Windischgrätz, which he purchased, in Prague. In September, 1873, he renounced all his rights and personal property, on condition of Prussia's paying him an annuity of 200,000 thalers during his life.

VI. MECKLENBURG-SCHWERIN.

FREDERICK FRANCIS II., grand duke of Mecklenburg-Schwerin, a German soldier, born Feb. 28, 1823. He became grand duke in 1842, was in the same year made a general in the Prussian army, and participated in 1864 in the war against Denmark, and in 1866 against Austria. He joined in 1867 the North German confederation, and on the outbreak of the Franco-German war (July, 1870) he was made commander-in-chief of the 13th army corps. He captured Laon (Sept. 9), Toul (Sept. 23), and Soissons (Oct. 16), and was placed at the head of a new corps in the operations against Paris. He defeated Kératry at Dreux (Nov. 17), and after joining in various engagements near Orleans under Prince Frederick Charles, he took possession of Blois (Dec. 13) and contributed to the defeat of Gen. Chanzy near

Vendôme (Dec. 15) and Le Mans (Jan. 12, 1871), and captured Alençon. His grand duchy had in the mean while become a member of the German empire. On the entrance of the German army into Berlin (June 16, 1871) the emperor William appointed him chief of the second inspection of the army.

VII. PRUSSIA (INCLUDING BRANDENBURG).

FREDERICK WILLIAM, elector of Brandenburg, usually styled the Great Elector, and the founder of the Prussian monarchy, born in 1620, died in Potsdam, April 29, 1688. He came to the electoral power at the age of 20 (1640), on the death of his father, George William, the 10th elector. The father had been a feeble prince, with a traitorous minister. His estates had for many years been ravaged by the contending parties in the thirty years' war. The cities lay almost in ruins, the villages had been for the most part burned and depopulated, and a part of his paternal inheritance had been confiscated by the Swedes. The young prince began his reign by dismissing his father's unworthy council, regulating his finances, and negotiating with so much address as to regain his lost provinces, which were guaranteed to him by the peace of Westphalia eight years later. A year after his accession he concluded a treaty of neutrality with the Swedish queen Christina, and three years after, by an armistice with Hesse-Cassel, the strong outpost city of Cleves and the county of Mark in Westphalia were added to his dominions. Under the treaty of Westphalia (1648) the elector, who had just claims to the whole of Pomerania, received only the eastern portion of that country; but as an indemnification for the loss of the western division and the island of Rügen, he obtained the county of Hohenstein, the bishoprics of Minden, Halberstadt, and Kamin, as lay principalities, and the reversion of the archbishopric of Magdeburg. After the conclusion of the peace, Frederick William directed his attention to the organization of a standing army, and after a few years he had an army of 25,000, disciplined according to the Swedish system. He formed an alliance with Charles X. of Sweden in 1655 against Poland. The sequel was the fall of Warsaw, and Frederick's achievement of the independence of his Prussian duchy, formerly under enfeoffment to Poland. Louis XIV. at this time was pursuing his project of a Rhine frontier and the conquest of the Spanish Netherlands. He seized a line of frontier towns, and invaded Holland (1672). Of the German princes, the elector of Brandenburg alone seemed conscious of the danger, and after arming his exposed Westphalian dominions he appealed successfully to the emperor Leopold I., to Denmark, to Hesse-Cassel, and other German states. A joint army was placed under the command of an imperial general; but the imperial coöperation was crippled through the machinations of Leopold's privy councillor, Lobkowitz, who

became a secret tool of the French ministers. Frederick William was compelled thus to come to terms with France, with the loss of Wesel and Rees (1673). Immediately after this event, Leopold resuming operations against the French, the elector again took up arms, and Louis, in order to keep the electoral forces occupied in their own country, engaged the king of Sweden to advance upon Berlin. The Swedes accordingly entered Brandenburg by a rapid forced march. Frederick William arrived suddenly from the Rhine at Magdeburg, and hurrying across the Elbe at the head of his cavalry (only 6,000 in number), surprised the Swedes at Fehrbellin. His infantry (11,000) were many miles in the rear, but he attacked the enemy without delay, June 18, 1675. The rout was complete. Frederick pursued the flying enemy into Pomerania, and reduced the greater portion of the province. By the treaty of St. Germain, June 29, 1679, the elector restored nearly all his conquests, and received from France 800,000 crowns. He now devoted himself to the prosperity of his dominions and the extension of their area. He founded universities, welcomed 20,000 Protestant exiles whom Louis XIV. banished from France, and made it the aim of his life to oppose French aggression and to protect the liberties of Germany.

FREDERICK I., first king of Prussia, son of the preceding, born in Königsberg, July 22, 1657, died Feb. 25, 1713. He became heir apparent on the death of his elder brother. Deformed by having been dropped from the arms of his nurse, and of weak constitution, his education was neglected, and thus his stepmother could the more easily persuade the old elector to bequeath a part of his possessions to her children. But Frederick, who was no less ambitious than his father, and was assured of the favor of the emperor Leopold I., on his accession as elector in 1688 under the name of Frederick III., took immediate possession of the whole inheritance, declaring the will null, and satisfying his step-brothers with offices and pensions. While vying in brilliancy with the court of Louis XIV., he also strenuously continued his father's policy of aggrandizement. Seeking the alliance of influential princes, he lent several of them his troops, on condition of mutual support or payment in money. Thus 6,000 of his soldiers aided William of Orange to secure the throne of England, and fought in the great battle of the Boyne; 20,000 fought successfully against the French, who had ravaged the Palatinate (1689); 15,000 joined the quadruple alliance of the Empire, Spain, Holland, and England, and fought on the Rhine (1690); 6,000 were sent (1691) to assist the emperor in his Hungarian war against the Turks, and contributed to the victories of Zálánkemén, Belgrade, and Zenta. But all these services procured Frederick in the peace of Ryswick (1697) politically only the confirmation of the stipulations granted to his father by the treaties of Westphalia and St. Germain. Private negotiations, however, with

several reigning houses gave him in part the immediate possession of, and in part hereditary claims to, various territories, which greatly enlarged the limits of his dominions. He gained the royal crown only after long negotiations by a treaty with the emperor, concluded Nov. 16, 1700, and based on the humiliating obligation to aid the emperor with 10,000 troops in the threatening war of the Spanish succession, to support the house of Austria in every debate in the diet, and to vote for its princes at every imperial election. Hastening to Königsberg in the midst of winter, Frederick placed the crown on his own head and on that of his wife, the sister of George I. of England, Jan. 18, 1701. On this occasion he founded the order of the black eagle. In the wars of Charles XII. of Sweden Frederick took no part, being actively engaged in the support of his ally the emperor in the long struggle against Louis XIV. He sent to the army on the Danube 20,000 men, who took part in the battle of Blenheim (1704), and to Italy 6,000, who greatly contributed to Eugene's victory at Turin (1706). Frederick is praised for his natural kindness, love of his subjects, and loyalty to his allies; but his vanity, love of pomp, and extravagance led to ruinous extortions. He founded the university of Halle, the Berlin academies of science and of sculpture and painting, and the supreme court of appeal. Like his father he defended Protestantism in Germany.

FREDERICK WILLIAM I., second king of Prussia, son of the preceding and Sophia Charlotte of Hanover, born in 1688, died May 31, 1740. He served in the allied army against France, and distinguished himself at the siege of Menin and the battle of Malplaquet. The new monarchy (dating from 1701) had been ungraciously recognized by the crowned heads of Europe, and the crown prince early conceived the design of making for Prussia a conspicuous place among the powers by means of an army. He ascended the throne Feb. 25, 1713, and by strict economy was enabled to maintain a peace establishment of 60,000, and at length of 72,000 men, being $\frac{1}{6}$ of his subjects. His ruling mania was to form a corps of giant soldiers; and for this purpose his envoys ransacked the world. An Irishman measuring seven feet was induced to enlist by a cash bounty equivalent to \$6,200, a sum much greater than a year's salary of the Prussian ambassador who found him in the streets of London. During a reign of 27 years Frederick William preserved uninterrupted peace for Prussia, with the exception of a short misunderstanding with Charles XII., and a little idle soldiering under Prince Eugene. In 1713 he had concluded with Sweden, during Charles's absence in Turkey, a treaty, the object of which was to preserve Swedish Pomerania from Russia and Saxony. In consideration of 400,000 thalers, Frederick received the cities of Stettin and Wismar, and was to mediate between the belligerents. Charles, return-

ing from Turkey, insisted on the restoration of Stettin, but refused to refund the money. Frederick promptly declared war, and took the field in person; and the result was the acquisition of Pomerania as far as the river Peene, with Stettin, and the islands at the mouth of the Oder, on payment of 2,000,000 thalers. The following characteristic speech was addressed by the king to his privy council when about to take the field for this war: "As I am a man, and may therefore die of a shot, I command you to take good care of Fritz [the crown prince Frederick, then three years old]; and I give all of you, my wife to begin with, my curse, if you do not bury me at Potsdam in the church vault there, without feasting and without ceremony." The wife of this amiable husband, Sophia Dorothea of Hanover, bore ten children; among whom the eldest son (afterward Frederick the Great) and a daughter, Wilhelmina, incurred the ferocious hatred of the father. His son wrote of him: "He had an industrious spirit in a robust body, with perhaps more capacity for minute details than any man that ever lived; and if he occupied himself with little things, it was that great results might be the consequence." His character was singularly full of contradictions. He was at once just and cruel; parsimonious and liberal; a careful and a brutal father; a defender of Lutheranism and protector of Protestant refugees, yet punishing metaphysicians with exile. But he liberally rewarded all who introduced any new art, and many of the greatest manufactories in Prussia owe their foundation to him. He also founded the medico-chirurgical college and two charitable institutions at Berlin, and an orphanage at Potsdam. He left to his son \$6,000,000 surplus money, 72,000 soldiers, 2,240,000 subjects, and a territory of 45,000 square miles.—See Droysen's *Friedrich Wilhelm I.* (2 vols., Leipzig, 1869).

FREDERICK II., third king of Prussia, known as Frederick the Great, eldest son of the preceding and the princess Sophia Dorothea, daughter of George I. of England, born in Berlin, Jan. 24, 1712, died at the château of Sans Souci, near Potsdam, Aug. 17, 1786. Up to the age of 20 he was subjected to a cruel paternal tyranny. Educated chiefly by French refugees, he conceived a strong passion for French literature, and knew nothing of any other foreign language. Latin his father positively forbade. He was passionately fond of music, attained a high perfection as a player on the flute, and gave concerts at which his own compositions were performed, and to which he invited eminent musicians, who admired his masterly performance in adagio. He gave employment to Graun in his chapel at Rheinsberg, and after his accession to the throne appointed him chapel master and sent him to Italy to engage vocalists for the projected new opera at Berlin, the establishment of which was thus due to Frederick. He was

also very fond of poetry, but, ignorant of Dante or Shakespeare, Virgil or Homer, surrendered himself to Voltaire and the *Henriade*. "My royal titles," he wrote to his French idol, "shall run thus: 'By the grace of God, king of Prussia, elector of Brandenburg, possessor of Voltaire,' &c." Within a week he wrote to Algarotti that he knew Voltaire was a scoundrel, but that he could make use of him. *Je veux savoir son français; que m'importe sa morale?* After narrowly escaping death from his father's hand, he determined to seek safety in England with his uncle George II. He was overtaken, brought a prisoner to Küstrin, compelled to witness the execution of Katt, a young officer who had been privy to his flight (1730), was himself condemned as a deserter, and was only saved by the interposition of the emperor of Germany, the kings of Sweden and Poland, and the states of Holland. His father caused him to be informed that if he would renounce the throne he might study, travel, or do whatever he pleased. "I accept," said Frederick, "if my father will declare that I am not his son." After a long imprisonment, he was appointed a councillor of war, and charged with duties which virtually banished him from court. In 1733 his father required him to marry Elizabeth Christina, daughter of the duke of Brunswick-Bevern, and in 1734 permitted him to take up his residence at the castle of Rheinsberg, where he could pursue his favorite amusements unmolested. Here he wrote many of his works, including the *Anti-Machiavel* (the Hague, 1740). Meantime the heart of the old king grew softer; a reconciliation followed; and the father, pressing his son to his heart, sobbed forth with almost his latest breath (1740): "My God, my God, I die content, since I have such a noble son and successor." Frederick's character had been wholly misconceived by his subjects and by the world. One class thought him a mere sensualist, a rhapsodical voluptuary; others looked forward to a reign of moderation, peace, and universal benevolence. Both of these classes of judges, with *Anti-Machiavel* before them, and a knowledge of the epicurean abode at Rheinsberg, might find ground for their predictions; and both were equally confounded at the almost instantaneous transformation effected by the crown. A military despot, listening to no council, confiding in no friend, bent upon the single purpose of enlarging his monarchy, he regarded himself as an instrument appointed to elevate Prussia, and embody in the parvenu title of Prussian king that substantial possession of royal power which could only come from enlarged dominion. The pragmatic sanction of Charles VI., guaranteed solemnly by Europe, and by no member of the family of nations more solemnly than by Prussia, had, it was supposed, secured the peaceful inheritance of the Austrian dominions to the young Maria Theresa as archduchess of Austria and queen of Hungary

and Bohemia. Frederick, immediately on her father's death, sent her an offer of pecuniary aid and his vote for her husband Francis as emperor of Germany, on condition of the cession of the duchies of Glogau and Sagan, to which, as well as the greater part of Silesia, the house of Hohenzollern laid claim. This being rejected, in December he entered Lower Silesia at the head of his army, routed the handful of Austrians who were quartered on the frontier, and overran the province. In six weeks he returned to Berlin in triumph. Frederick officially pretended to justify himself, but privately acknowledged that "ambition, interest, the desire to make people talk about me, carried the day; and I decided to make war." He had inherited from his father a splendid army of 70,000 men, formed by his general Leopold of Dessau, at that period the finest troops in the world. There was in the treasury a surplus of \$8,000,000. He felt that a bold stroke might be made, and that by means of a strong military organization he could obtain for his two and a quarter million subjects a foremost place among the great nations around him. Hastening in the spring (1741) to rejoin his troops, he fought his first battle at Mollwitz. His army was victorious, but its leader had fled. He had beheld real war for the first time, and so completely lost his self-command as to gallop miles from the field. His personal courage had been previously well established, when a volunteer under Prince Eugene against the French; but he saw during that campaign nothing of the fury and carnage of war. The battle of Mollwitz (April 10, 1741) decided the fate of Silesia. It was, however, the signal for a general war in Europe, known as that of the Austrian succession. Bavaria, with France, now took up arms. A French, Saxon, and Bavarian army invaded Bohemia, while Frederick marched into Moravia. The fortunes of the youthful queen grew darker still when England, her last ally, determined upon neutrality. Frederick gained a second victory at Chotusitz, near Czaslau, May 17, 1742, and at once effaced by personal prowess the blot upon his victory at Mollwitz. Accepting English mediation, Maria Theresa made peace with Prussia by a treaty concluded at Breslau, June 11, and ceded Silesia and the county of Glatz. Frederick withdrew from Moravia, while the Austrians everywhere triumphed against France and Bavaria. He profited by this interval of peace to strengthen his army and organize new conquests. England meanwhile declared for Austria, and British troops fought at Dettingen. On the death of the last count of East Friesland, in 1744, Frederick took possession of that country, which by the grant of the emperor Leopold in 1694 was to revert to the house of Brandenburg. He grew anxious in the midst of ceaseless Austrian victories, and fearing to be dispossessed of Silesia, in August, 1744, he marched into Bohemia at

the head of 100,000 men, took Prague, and threatened Vienna. He confesses that this campaign was filled with blunders; that no general ever committed graver faults; and it appears that during this year he first learned to be a general. He retreated rapidly, but only to retrieve the past. In the next campaign, at Hohenfriedberg, he defeated a joint army of Austrians and Saxons (June 4, 1745), in a manner which placed him at the head of contemporary commanders. This victory was followed by those of Sorr (Sept. 30) and Kesselsdorf (Dec. 15), and the fall of Dresden; and having no longer reason to fear that Maria Theresa could avenge herself, he deserted his French ally, and made peace with Austria and Saxony by the treaty of Dresden (Dec. 25), by which he acknowledged Francis as emperor, and was confirmed in the possession of Silesia. Frederick by this time had doubled the number of his subjects, and had succeeded so well in humbling Austria and her allies, that he appeared to hold in his hand the balance of power in Germany. His people now enjoyed 11 years of peace, during which he devoted himself to the organization of his states and his army, the advancement of the arts, agriculture, manufactures, commerce, and education, the amelioration of the laws, and the increase of the public revenues. He also wrote his *Mémoires pour servir à l'histoire de Brandebourg* (2 vols., Berlin, 1751), his poem *L'Art de guerre*, and many other productions in prose and verse. This was a period, nevertheless, of constant anxiety and insecurity; and learning in 1756 that a new coalition, including Russia and his former ally France, was forming against him, Frederick at once prepared for the encounter, suddenly allied himself with England, and the whole face of affairs was changed. Sweden, the tool of France, followed the French leading; and Frederick, with scarcely 5,000,000 subjects, including the conquered Silesians, found himself alone on the continent against nearly 100,000,000. It was resolved to crush him; but he had foreseen this design, detected all the secret intrigues, and resolved to strike the first blow. In August, 1756, with 70,000 men, he entered Saxony, and commenced the famous seven years' war. His army had grown to 160,000 men, but his enemies could bring 600,000 troops into the field, and there was not a politician in Europe who did not look upon his destruction as certain. He himself thought it probable; but he had an overflowing treasury at home, and plenty of money from England, and he hoped that genius, judgment, and resolution, with ordinary good fortune, might at least sustain him until his enemies should quarrel among themselves. At Dresden he seized some state papers which exposed the designs of the coalition. They were published, and the world saw that this time he had right on his side. He defeated the Austrian general Braun at Lowositz (Oct. 1); the Saxon army under Rutowski surrendered a

fortnight later, and the whole of Saxony was reduced, and became virtually a part of Frederick's dominions. He levied troops and supplies; and thus, within a few weeks, one of the confederates was made to turn his weapons against the others. The next campaign opened with the great battle of Prague, May 6, 1757. Frederick was victorious, but lost 12,000 men, and among them his general Schwerin. A second battle was fought and lost against Daun at Kolin, June 18. Frederick abandoned Bohemia. French troops invaded Prussia, and his army lost confidence. French, Swedes, and Russians were marching upon Berlin; and Frederick, mourning the death of his mother, whom he tenderly loved, provided himself with poison, and meditated suicide. He marched from Bohemia against the French, and with half their numbers defeated them at Rossbach, and took 7,000 prisoners (Nov. 5). He now turned against the Austrians, who had entered Berlin, and captured Schweidnitz and Breslau. On Dec. 5, at Leuthen, with 80,000 men, he attacked 80,000, killed or captured 27,000, and took 130 guns, 50 standards, and 4,000 wagons. Early in 1758, having previously recovered Breslau, he was again ready for action, recaptured Schweidnitz, and with 37,000 troops fought almost hand to hand with 60,000 Russians at Zorndorf (Aug. 25). It was the fiercest and bloodiest battle of the war. Frederick ordered that no quarter should be given, so enraged was he with the devastations committed by the invaders; and 19,000 Russians and 11,000 Prussians lay upon the field, dead or wounded, at the close of this fearful day. The Russians abandoned Prussia, and Frederick marched into Saxony. He had beaten French, Austrian, and Russian armies in turn, each with more than double his force; but close upon these triumphs followed a chain of disasters which would have overthrown any other commander. At dead of night he was surprised and terribly defeated by Daun at Hochkirch (Oct. 14), but rallying in an incredibly short time he rescued Dresden from an overwhelming army of Austrians, and went into winter quarters at Breslau. The year 1759 saw the Austrians overrunning Saxony, Russians victorious upon the Oder, Frederick utterly routed by Soltikoff and Laudon at Kunersdorf, Aug. 12 (where he lost two thirds of his troops), and Berlin saved only by the king's miraculous energy. Dresden was taken by the troops of the empire, and near it Gen. Fink surrendered 12,000 Prussians. The fifth year saw the capital in the hands of the Russians, while Frederick won great battles at Liegnitz, Aug. 15, 1760, and Torgau, Nov. 3, the one over Laudon, and the other over Daun. The sixth year was also unfavorable, but he still fought on. The circle seemed to be closing around him, and he grew savage with despair. England, after the death of George II., deserted him, but Russia, on the death of Elizabeth (1762), withdrew from the coalition. Fred-

erick broke into Silesia and defeated the Austrians at Burkersdorf, and his brother Henry was successful at Freiberg. France withdrew her armies, declaring future neutrality; and Prussians and Austrians stood alone against each other. The empress now gave way, and in February, 1763, peace was signed at Hubertsburg, leaving Frederick in possession of Silesia, the sole object, short of saving Prussia itself, for which he had fought. After an absence of eight years he reentered Berlin in triumph. He had proved himself the greatest commander of his age, although he owed many a defeat to his own rashness, and many a victory to such generals as Ferdinand of Brunswick, Schwerin, Seydlitz, Zieten, and Prince Henry. But his capital had been more than once plundered; the population had suffered frightfully. He found the number of his subjects diminished by one tenth; a sixth of the male able-bodied adults had died on the field of battle. Cossacks and Croats had slaughtered young and old, women and children. Fields were unsown; villages and hamlets were deserts. But, say historians, Frederick did not owe a dollar. His first object was the thorough restoration and reorganization of the army. During every moment of the 23 remaining years of his life, he was armed at all points. His energies meanwhile were employed with equal devotion in the restoration of his country. The corn which had been provided for the next campaign was bestowed upon the destitute. In Silesia taxes were remitted for six months; in Pomerania and New Brandenburg for two years. Immense sums of money were expended in agricultural and industrial improvements; in all, during the remainder of his reign, 24,000,000 thalers. To meet these and other similar ends, the most rigid economy was practised. The royal household was so frugal that the king saved annually from the sum appropriated to his court nearly 1,000,000 thalers. His envoys in England and France had salaries less than \$5,000 a year. The king himself had but one fine dress during the remainder of his life. Shabby old garments and snuffy yellow waistcoats were his daily wear; and when it was found at his death that he did not possess a single decent shirt, he was buried in one belonging to his *valet de chambre*. The only exception to his economy was caused by his love of building. He was himself singularly industrious. He spent 20 hours out of the 24 in some active bodily or mental employment. He rose at four, and retired at midnight. Dinner was the scene of intellectual activity, a school of wit and discussion. Religious persecution was unknown in his dominions; perfect order reigned throughout; property was secure; speech and the press were free. Lampons and libels on himself he wholly disregarded. "My people and I," he said, "understand each other. They are to say what they like, and I am to do what I like." Cheap and speedy justice was administered. In commer-

cial policy and international law he was in advance of his time. Devoted as he was to letters, he never allowed the passion for literature to divert him from duty. He had no knowledge of the force of the German language, and spoke of it with contempt; yet he never wrote French correctly. Though respectable as a historian, and voluminous as a versifier, he never learned to spell the language which he idolized. In the year 1772 was concerted the dismemberment of Poland. It originated between Frederick and Catharine of Russia; a most unwilling consent was wrung from Maria Theresa. Frederick took possession of his share without delay. Later important public acts of his life were his successful opposition in 1778 to the claim of the emperor Joseph II. to the Bavarian succession; the establishment in 1785 of the so-called confederation of princes (*Fürstentbund*); and a treaty with the United States of America, embodying the most elevated principles of international rights. Without much community of political sentiment, he was friendly to the American patriots, and gave evidence of his dislike of British policy in employing Hessian troops beyond the Atlantic, by levying the same toll per head upon the recruits which passed through his dominions as was charged upon "bought and sold cattle." Washington commanded his admiration, and Mount Vernon received among its treasures a Prussian sword of honor, forwarded from Potsdam with the words: "From the oldest general in the world to the greatest." Frederick died after a severe attack of dropsy, at the age of 74; he left no children by his wife, with whom he never cohabited, and was therefore succeeded by a nephew, Frederick William II., to whom he left a surplus of \$50,000,000, an army of 220,000 men, a territory increased by nearly 80,000 sq. m., and an industrious, intelligent, and happy population of 6,000,000. His collected works have been published by order of the king of Prussia, under the auspices of the royal academy of sciences (30 vols., Berlin, 1846-'57). Extensive works on Frederick have been written by Kolb and Preuss. See also Carlyle's "History of Friedrich the Second" (6 vols., London and New York, 1858-'64); *Friedrich der Grosse und Katharina II.*, by Kurd von Schlözer (Berlin, 1859); *Geschichte Friedrich's des Grossen*, by F. Kugler (7th ed., Leipzig, 1870); and *Friedrich der Grosse*, by Droysen (1st vol., 1878).

FREDERICK WILLIAM II., king of Prussia, born Sept. 25, 1744, died Nov. 16, 1797. He was the grandson of Frederick William I., nephew of Frederick the Great, and son of the prince Augustus William, who, having incurred the resentment of his brother the king by an unsuccessful retreat after the disastrous battle of Kolin (1757), shortly after died. Frederick William, having become heir presumptive to his uncle, received from him but rare marks

of cordiality or affection, was rather austere, educated, and often exposed to all the dangers of the war during the last period of the seven years' struggle. He enjoyed little freedom in the second and peaceful half of Frederick's reign, was obliged to repudiate his first wife, Elizabeth of Brunswick, because of ill conduct, and lived in a circle of his own, in which some visionaries of the then powerfully organized sect of illuminati were particularly conspicuous, who maintained their influence over him even after his accession to the throne. This took place on Aug. 17, 1786. Freed from long restraint, the new king gave himself up without moderation to his voluptuous inclinations. Mistresses and favorites reigned in the court and squandered the treasures of the state. He sought to gain the favor of the people by ostentatious mildness; even the discipline of the army was relaxed. The first important act of his policy abroad, which was but slightly influenced by the energetic minister Herzberg, was to reinstate in power his brother-in-law the stadtholder of the Netherlands, who had been deposed by the anti-Orange party. A Prussian army under the duke of Brunswick entered Holland, occupied Amsterdam, and restored the ancient order of things, which was confirmed by a treaty concluded in 1788, at the Hague, by Prussia, England, and Holland. Alarmed by the alliance of the emperor Joseph II. with Catharine II. of Russia, and by the successes of the Russians in the war against Turkey, he concluded a treaty with the latter power guaranteeing all its possessions. An army was assembled in Silesia, near the Bohemian frontier. Before the outbreak of the war, however, Frederick William wavered, and finally restored his good understanding with Austria by the treaty of Reichenbach (1790), concluded with the successor of Joseph, Leopold II., who soon also made peace with the Porte. Russia, however, was allowed to continue her operations undisturbed. Herzberg resigned. The interview at Pillnitz with the emperor (1791) prepared the first coalition against the French revolution. The hostile operations began in the spring of 1792. The duke of Brunswick entered France in the summer; the king and the crown prince, the son of his second wife, Louisa of Hesse-Darmstadt, joined him there. Want of harmony and repeated blunders on the part of the allies, revolutionary fanaticism and the skill of the commanders on the side of the French, soon turned the scale in favor of the latter, compelling Frederick William to keep the defensive, and finally to conclude the treaty of Basel (1795) with the republic, in which he ceded his territories beyond the Rhine, contracting for future indemnities and a kind of protectorate over northern Germany. His participation in the affairs of Poland was productive of more advantageous results. Having encouraged the so-called long Polish diet in its efforts to regenerate the state and to make it independent of

Russia, by a treaty in which he guaranteed its integrity (1790), he afterward, when engaged in the war with France, found it more convenient and profitable to share the prey with Russia and Austria. He marched his army into Poland, and actively promoted the second and third dismemberments of the unhappy republic (1793-'95). His share was large, extending to the Niemen, and including the capital, Warsaw. These wars and the extravagance of the court exhausted the finances of Prussia. Intolerant edicts and severe restrictions of the press contributed to make his reign unpopular; but it was not without merit in developing the resources of the state and the welfare of the people by useful internal improvements. The judicial organization of Prussia was also greatly promoted under Frederick William. He completed and introduced the code of laws prepared by Frederick the Great.

FREDERICK WILLIAM III., eldest son and successor of the preceding, born Aug. 3, 1770, died June 7, 1840. Educated with care by his virtuous mother, Louisa of Hesse-Darmstadt, he had ample opportunity of comparing, at the courts of Frederick the Great and of his father, the opposite influence of royal virtues and vices upon the affairs of his state; and he early contracted the love of order, discipline, economy, and labor, which in after time contributed no little to the prosperity of his people. He accompanied his father to the conference of Pilnitz, and to the army of the first coalition against France, and in 1798 married the beautiful and accomplished princess Louisa of Mecklenburg-Strelitz, the most popular queen of Prussia. After his accession (Nov. 16, 1797) the court and the administration were purged of the creatures and abuses of the preceding reign. The unpopular edicts restricting the press and the freedom of religious instruction were abrogated, and economy and order restored. In his foreign policy the young king maintained the neutrality imposed by the treaty of Basel, the temporary stipulations of which were made definitive by the treaty of Lunéville (1801). For its cessions on the left bank of the Rhine, Prussia soon after received ample compensations in small territories deprived of their independence as members of the empire by decree of the Germanic diet. Satisfied with his acquisitions and political influence in the north of Germany, Frederick William refused to join the third coalition against France which was formed by England, Russia, and Austria. But when the French armies had infringed the neutrality of the Prussian territories, he secretly allied himself with Alexander of Russia, during a sudden visit of the latter at Berlin. Hesitation, however, spoiled the effect of this alliance, and the battle of Austerlitz was followed by a new treaty with Napoleon (December, 1805). Ceding Anspach, Cleves, and Neufchâtel, Prussia received Hanover from the conqueror. The consequence of this exchange was what Napoleon wanted, a declaration of

war by England against Prussia. The latter was also embroiled with Sweden. Having made peace with these enemies, Frederick William made peremptory demands on Napoleon in behalf of the neutrality of his state and its allies in northern Germany. Napoleon answered with prompt hostilities, and the battles of Jena and Auerstädt were both fought on Oct. 14, 1806. The powerful Prussian army was broken, Berlin was occupied by the enemy, and the fortresses surrendered at the first summons. The aid of Alexander was of little avail. After a winter campaign in Prussian Poland and the indecisive battles of Pultusk (Dec. 26) and Eylau (Feb. 7-8, 1807), Napoleon conquered peace by the battle of Friedland, won on the anniversary of Marengo (June 14). The treaty of Tilsit (July) sacrificed one half of Prussia, parts of which were transformed into the duchy of Warsaw, and others attached to the kingdom of Westphalia. The other half remained for years in the hands of the conqueror, and was treated as a subdued province. The treaty further provided for the reduction of the Prussian army to 40,000 men, and the payment of an indemnity of 146,000,000 francs to France. French troops were to occupy Berlin and other important Prussian fortresses till the payment of the debt. The king, who paid a visit with the queen to Alexander, could not return to his capital before 1809. But this gloomy period became one of the most successful in the history of the state, by a series of salutary and energetic reforms, undertaken and executed particularly under the celebrated ministers Stein and Hardenberg. Serfdom was abolished, the towns obtained some independence in the management of their affairs, the royal domains were sold, convents and ecclesiastical foundations were converted into state property, public instruction was organized, and the new university of Berlin founded. The new system of military organization of Prussia had also its origin in that period. In July, 1810, the king lost his wife. In 1812 he was compelled to aid Napoleon with an army against Russia. Forming the left of the great French army of invasion, it was saved on the retreat by a special arrangement between its commander, York, and Diebitsch. Frederick in January, 1813, transferred his residence to Breslau, where he was visited in March by the emperor Alexander, and the treaty of Kalisz, which had been concluded the preceding month between Russia and Prussia, was made public. He now issued a proclamation, which was answered by a general rising of the nation against France. The capital alone is said to have contributed 10,000 men. Prudent measures had been adopted in secret to prepare for the struggle. The young men, meeting privately, had been drilled in the use of arms in small detachments. Thus the power of the people answered to their will. The militia having been summoned, war against France was declared on March 17. The situation had its dangers. The French still

held the fortresses of Prussia and Poland; their army in the dominions of the king still amounted to 60,000. But Napoleon's hour of success had passed. The continual desertion of his allies served to strengthen the phalanx of the coalition after every defeat of his armies. His enormous new levies were not sufficient to cover the extraordinary losses, and to face so many enemies. The Prussians fought bravely in various engagements in 1813 and 1814 (see BLÜCHER), and the king often gave proofs of personal activity and courage. He entered Paris with his allies, accompanied Alexander on his visit to England, made a triumphal entry into his capital in August, 1814, and repaired to the congress of Vienna. The stipulations of this congress conferred on Prussia greater power than it possessed before the wars, enlarging it particularly with parts of Saxony, one of the last allies of Napoleon. The sudden return of the captive of Elba called the Prussians again to arms, and Blücher, after his previous defeat, appeared at Waterloo in time to finish the great struggle. The last 25 years of the reign of Frederick William form a period of undisturbed peace and prosperity for Prussia. Closely allied with the czar Alexander, and afterward with Nicholas, the king pursued a policy of strict conservatism. Much was done for internal improvements, little for political reform. He, however, formed the great German commercial league, the Zollverein. Revolutionary agitations, wherever they manifested themselves, were suppressed with severity. The last years of his reign were agitated by a strife with the Roman Catholic clergy. The eldest of his four sons succeeded him. One of his daughters was married to the emperor Nicholas. In 1824 he had formed amorganatic marriage with the countess Augusta of Harrach, whom he made princess of Liegnitz. She died in Hamburg, June 6, 1873, aged 72.

FREDERICK WILLIAM IV., son and successor of the preceding, born Oct. 15, 1795, died at the château of Sans Souci, near Potsdam, Jan. 2, 1861. He received a careful scientific education, though his boyhood was passed in the most disastrous period of Prussian history, and his youth in that of the great struggle against Napoleon. He was often present on the scene of action during the last campaign against that emperor, became familiarly acquainted with many distinguished men of his age, and developed his taste for the fine arts while residing in Paris after its occupation by the allies, and on a journey to Italy in 1828. Admitted to the councils of his father, he evinced a marked independence of opinion with much administrative ability. As military governor of Pomerania, his affability gained him general popularity. He succeeded to the throne June 7, 1840. His first solemn declaration at Königsberg, a limited political amnesty, the reinstating of Arndt, the old liberal poet, the reappointment to office of the popular lieutenant general Von Boyen, and the con-

ciliatory termination of a difficulty between the state and the Roman Catholic clergy, were hailed with applause; but the appointment to office of Hassenpflug and Eichhorn, and various other conservative measures, soon destroyed the hopes of the liberal part of the nation. The development given to the representation by provincial estates, which had been introduced under the preceding reign, by the convocation of their standing committees in 1842, and by the convocation of the united provincial estates of the kingdom in February, 1847, was made less significant by the distinct declaration of the king that the representatives, far from becoming legislators, would be allowed only to give advice to the unlimited sovereign, and that he would never consent to bind his inherited authority by a written compact. Periodical meetings of the united assembly were asked for in vain. The government, though granting general toleration, declared against the separation of the church from the state and the emancipation of the Jews, and avowedly sought to rule the kingdom in conformity with the views of the school generally known as pietists. Much more was done for the material interests of the state through internal improvements, commercial union with foreign states, and the extension of the Zollverein, which also augmented the political influence of Prussia. A bank with a capital of 10,000,000 thalers was established at Berlin. The Polish conspiracy of 1846, which threatened the eastern possessions of the king, was detected in time in the duchy of Posen; the outbreak in the same province was easily suppressed; the insurgents of Cracow, who laid down their arms on Prussian territory, were treated with rigor. The people were already politically agitated by the lively discussions of the diet (from April 11 to June 26, 1847), and of its standing committees, assembled Jan. 18, 1848, and also by the trial of the insurrectionists of Posen, and of Mirowski, the destined leader of the Polish movement, as well as by the victory of the liberals in Switzerland over the Sonderbund, the constitutional movements in Italy, and the revolution in Sicily, when the news of the French revolution of Feb. 24 involved the whole of Germany in a flame. The popular movement was victorious all over the southwest and south of the confederation, before Frederick William was forced to yield to it. Even after the fall of Metternich in Vienna (March 13), he was determined to maintain his royal authority, and to grant liberties only as free gifts. Threatening popular gatherings in Berlin were dispersed by his soldiery before he proclaimed the freedom of the press and the promise of a change in the form of government. These concessions were received with enthusiasm, but the people still demanded the removal of the troops from the capital, and for this purpose a deputation of citizens visited the palace (March 18), while a crowd assembled before it. The deputation

was refused admittance, and soldiers advanced from the court of the palace to clear the place. Some shots were fired, and the people dispersed in every direction with cries of "Treason! they are murdering us! revenge!" Hundreds of barricades were erected in a few hours, the arsenal was stormed, and a furious fight ensued, which raged till the morning of the next day, when the king commanded the retreat of the troops and their removal from the city. The corpses of the fallen combatants were carried into the courtyard of the palace, and the king was compelled to appear before them with uncovered head; the palace of his then very unpopular brother William, prince of Prussia, was declared national property. The ministry was dismissed, a civic guard organized, and a general amnesty granted. Mieroslawski, who had been sentenced to death, was carried in triumph through the streets of Berlin, and 250 of his associates left the prison with him, and hastened to Posen to commence the restoration of Poland, the new ministry promising its assistance. The king now openly and ostentatiously declared his purpose to take the lead in Germany; the diet was again assembled (April 2), to elaborate a new election law. It was dissolved after the passage of that law on April 5, and a constituent assembly was convened in Berlin (May 22), while the delegates of Prussia also appeared in the national German parliament which in Frankfurt had superseded the diet of the princes (*Bundestag*). Prussian troops were sent to Schleswig-Holstein to assist the German inhabitants in their revolt against the king of Denmark. In Posen, however, where the Poles had risen in a bloody insurrection, the troops restored order after furious contests with the half-armed hands under Mieroslawski (April and May). This was the first reactionary victory. Others followed. While the revolution was losing its time in endless speech-making, framing of constitutions, and scheming on the reorganization of Germany as a united empire, in the assemblies of Frankfurt, Berlin, Vienna, and elsewhere, the governments, which had maintained their armies, paved the way for a complete restoration of their power by mutual understanding, skilful counter-revolutionary manoeuvres, continually changing ministries, and varying programmes. Emboldened by the fidelity of the army and the growing desire for order among the wealthier classes, by the reaction in France, and the successes of the Austrian government in Prague, Lombardy, and Vienna, Frederick William prorogued the Prussian constituent assembly, transferring it to the town of Brandenburg, closed its sessions by an armed force under Wrangel (November), and finally dissolved it shortly after its reassembling in Brandenburg (Dec. 5), promulgating a liberal constitution of his own. The new elections took place according to the king's constitution, and the two chambers were convened in Berlin (Feb. 26, 1849), which remained in a state of siege. Of

these the lower house was still too revolutionary, and both were dissolved (April 27). In the mean time the king had not only abandoned the cause of Schleswig-Holstein by the armistice of Malmö, but had also declined the hereditary imperial crown of Germany offered him (March 28) by the Frankfort parliament. The Prussian army suppressed the revolution in Dresden, after a bloody struggle of three days (May), and in the Palatinate and Baden (June), while it was hardly more than a spectator in the renewed struggle in Schleswig-Holstein. A confederation of Prussia with Saxony and Hanover (*Dreikönigsbund*), and some minor northern states, formed March 26, was hailed by the so-called party of Gotha (Gagern, Dahmann, &c.) as the last hope for a union of Germany. It ended in failure. Opposed by Austria and its southern allies, it was given up by Saxony, Hanover, and others; its parliament of Erfurt assembled in vain (March 20, 1850). Frederick William, who had convoked a new Prussian assembly and confirmed a new constitution with his royal oath (Feb. 6), followed for some time a more popular course in the affairs of Hesse-Cassel (October), but soon yielded to the threats of Austria and her allies (November). Order was restored in Hesse and in Schleswig-Holstein, and the ancient Germanic diet was once more established in Frankfurt. The revolution was over. Chevalier Bunsen, who had lost his former liberal influence over the king, was obliged to sign the protocol of London in the Danish question (1852), which sealed Prussia's final surrender to the general reaction. Only Neuchâtel remained with Switzerland as a conquest of the revolutionary movement, and after some threats of war in 1857 it was ceded to that republic. The policy of the government was peaceful, and Prussia took no part in the Crimean war, though it participated in the peace of Paris (1856). The constitution was modified and remodelled; the revolutionary members of the assembly of 1848, Jacoby and others, were persecuted; the nobility (*die Junker*) and the pietists received new influence; the freedom of the press and of religion was circumscribed. In 1857 the king was seized by a malady connected with temporary insanity, which compelled him (Oct. 23, 1858) to give up the personal management of affairs, and travel in Italy and the Tyrol for his health. His marriage with Elizabeth, princess of Bavaria, being without issue, his brother William (present emperor of Germany) became regent, and succeeded to the throne in January, 1861.

FREDERICK CHARLES NICHOLAS, prince of Prussia, a German general, born in Berlin, March 20, 1828. He is the only son of Prince Charles, younger brother of the emperor William. He studied at Bonn, where Von Roon, the future minister of war, was his intimate companion. He took part in the Schleswig-Holstein war of 1848, and acquired a high reputation by his thorough knowledge of military

science. During the Franco-Italian war against Austria (1859) he applied himself particularly to the study of the organization of the French army. His *Militärische Denkschrift* was published in 1860 without his knowledge, showing how the Prussians could beat the French; and his comments elicited replies from French writers and attracted general attention in military circles. He greatly distinguished himself in the Schleswig-Holstein war of 1864; in the war against Austria in 1866; and most conspicuously as commander of the second army in the Franco-German war of 1870-'71, compelling the surrender of Metz, Oct. 27, for which he was made general field marshal. His next victories were achieved over the army of the Loire, and he entered the city of Orleans Dec. 5, repeatedly defeated Gen. Chanzy, and captured Le Mans, Jan. 12. He is represented in the war songs of the period as an iron prince, a valiant soldier, a bold artillery officer, a gay sportsman, and a man whose word can be depended upon.

FREDERICK WILLIAM NICHOLAS CHARLES, a German general, crown prince of Prussia and of the German empire, born in the new royal palace near Potsdam, Oct. 18, 1831. He received a thorough scientific education and the doctor's diploma from the university of Königsberg, of which he is rector. On Jan. 25, 1858, he married Victoria Adelaide, princess royal of Great Britain, who has borne him six children, the eldest of whom, Prince Frederick William Victor Albert, was born in Berlin, Jan. 27, 1859. In 1866 he was commander-in-chief of the second Prussian army, and essentially contributed to the decisive victory of Sadowa by his timely appearance at Chlum. In the Franco-German war of 1870-'71 he was at the head of the South German forces as commander-in-chief of the third army. The first victory of the war, that of Weissenburg (Aug. 4), and the greater one over MacMahon at Worth (Aug. 6), were achieved under his generalship; he took an equally brilliant part, together with the crown prince (now king) Albert of Saxony, in the great triumphs culminating in Napoleon's surrender with his army at Sedan, Sept. 2; won additional laurels during the siege of Paris, and was made general field marshal Oct. 28, although it had not been customary for royal princes to receive that title.

VIII. SAXONY.

FREDERICK III., surnamed the Wise, elector of Saxony, born in Torgau, Jan. 17, 1463, died May 5, 1525. He succeeded his father Ernest in 1486, in a part of his possessions, governing the rest in common with his brother John the Constant, who became his successor. He founded the university of Wittenberg, and, though not an avowed adherent of the reformation, greatly promoted it by his protection, procuring safety for Luther during the diet of Worms (1521), and subsequently sheltering him in the castle of Wartburg. After the death of

Maximilian I. (1519) he declined the crown of Germany, which was conferred, according to his advice, upon Charles V. The peasants' war embittered the last days of his life.

FREDERICK AUGUSTUS I., first king of Saxony, eldest son of the elector Frederick Christian, born Dec. 23, 1750, died May 5, 1827. He succeeded his father in December, 1763, under the tutelage of Prince Xavier, was declared of age Sept. 15, 1768, and in the following year married Maria Amalia, princess of Zweibrücken. The only fruit of this marriage was a daughter, the princess Augusta. He abolished the heavy taxes on foreign merchandise, consolidated the several departments for the management of the finances, encouraged industry, and improved navigation with canals and sluices. Paper money soon rose above par. He abolished torture and the farming of judicial offices, and reorganized the court of appeals. The claims of his mother to the possessions of her deceased brother, the elector Maximilian Joseph of Bavaria, induced him to ally himself with Frederick the Great against Austria in the short war of the Bavarian succession. Subsequently he joined the league of princes (*Fürstenbund*) formed under the protectorate of the Prussian monarch. In 1791 he declined the succession to the throne of Poland, offered him in the name of that country by Prince Adam Casimir Czartoryski. He also rejected the overtures of a conference of the emperors Leopold II. and Frederick William II. of Prussia, held at Pilnitz (1791), to join as an independent sovereign the first coalition against the French revolution, though he did not withhold his contingent as a member of the German empire when the war had been declared. In 1796 he took part in the treaty of peace and neutrality concluded with the French republic by the district of Upper Saxony. He maintained his neutrality during the war of 1805, but in the following year joined Prussia in the unhappy contest decided by the battle of Jena. Saxony, which fell into the hands of the French conqueror, was severely punished, and Frederick Augustus was compelled to ally himself with Napoleon. He assumed the title of king, and joined the Rhenish confederation. For the cession of several districts of western Saxony annexed to the new kingdom of Westphalia he was scantily compensated by a part of Lusatia, and after the peace of Tilsit (1807) more liberally by the duchy of Warsaw. He was a faithful vassal of the French emperor during the wars of 1809 against Austria and 1812 against Russia, and in 1813, when Saxony became the chief scene of the conflict. Having personally joined Napoleon shortly before the battle of Leipsic, he was declared after its bloody issue a prisoner of war by the emperor Alexander, was sent to Berlin, and afterward to the castle of Friedrichsfeld, but was allowed to reside at Presburg during the deliberations of the congress of Vienna. That congress restored to him half

of his German possessions, the other half being annexed to Prussia; the duchy of Warsaw was made a dependence of Russia as the kingdom of Poland. Returning to his capital in June, 1815, Frederick Augustus spent the last 12 years of his life in healing the wounds of his diminished country by promoting its agricultural, commercial, and mining interests, by establishing or developing institutions of art and science, and particularly by a strict administration of justice. His subjects bestowed upon him the surname of the Just. His brother Anthony succeeded him.

FREDERICK AUGUSTUS II., king of Saxony, born May 18, 1797, died Aug. 9, 1854. He was the eldest son of Maximilian, brother of the kings Frederick Augustus I. and Anthony. Having lost his mother, Carolina Maria Theresa, princess of Parma, at the age of seven, he was educated principally under the care of Forell, a distinguished Swiss, and of Gen. Watzdorf. Though often compelled to leave the capital of his uncle during the later campaigns of Napoleon in Germany, and frequently to change his abode, he eagerly pursued his studies, which included political economy, law, and military science; but botany became his favorite pursuit. When, in September, 1830, Dresden became a scene of political commotions, Frederick Augustus was placed by the old king Anthony at the head of the committee for public tranquillity. As the prince was very popular, this measure greatly contributed to quiet the agitation. On June 6, 1836, Frederick Augustus succeeded to the throne. As he was but partially occupied with political affairs, he made botanical tours and journeys to Istria, Dalmatia, and Montenegro (1838), to England and Belgium (1844), to Vienna and Hungary (1845), and to the Tyrol (1846). The movements of 1848, beginning in Saxony, as everywhere else in Germany, with great enthusiasm for liberty and German union, were followed in May, 1849, by a revolutionary outbreak in Dresden. This having been suppressed through the intervention of Prussia, things soon returned to their ancient order, and the reactionary movement continued to the death of the king, which was occasioned by a fall from his carriage on a new tour in the Tyrol. He was twice married, first to Carolina, daughter of the emperor Francis, and, after her death in 1832, to Maria, daughter of Maximilian I. of Bavaria. Both marriages being without issue, he was succeeded by his brother John.

IX. WÜRTTEMBERG.

FREDERICK I. (Wilhelm Karl), first king of Württemberg, son of the duke Frederick Eugene, born at Treptow, Pomerania, Nov. 6, 1754, died Oct. 30, 1816. He received his first instruction from his accomplished mother, a princess of Brandenburg-Schwedt, and completed his education at Lausanne, after the French fashion of that period, served in the

bloodless war of the Bavarian succession, accompanied his brother-in-law, the future Russian emperor Paul, on a journey to Italy in 1782, was made governor general of Russian Finland, and after having left it in 1787 lived for some time in retirement. In 1790 he was a spectator of the sessions of the French national assembly; in 1796 he fought against the French on the Rhine, and in the following year he succeeded his father on the ducal throne. He shared in the war of 1799, received by the treaty of Lunéville ample indemnity for territories lost on the left bank of the Rhine, and was allowed to assume the electoral dignity. In 1805 he made an alliance with Napoleon, joined the Rhenish confederation, and received from its protector the title of king. He deserted Napoleon after his disasters. The treaty of Vienna left him in possession of his kingdom. To conciliate his people after ten years of despotic sway, he gave them a charter, which was rejected by the estates. A new constitution was drawn up, but he died before it could be discussed. His first wife was a princess of Brunswick-Wolfenbüttel, who bore him two sons, William, his successor, and Paul, and a daughter, Catharine, afterward princess of Montfort. His second wife was the princess Charlotte Augusta Matilda of England, who died in 1828.

FREDERICKSBURG, a city of Spottsylvania co., Virginia, pleasantly situated in a fertile valley on the right bank of the Rappahannock river, at the head of tide water, about 50 m. N. of Richmond, and 110 m. above Chesapeake bay; pop. in 1870, 4,046, of whom 1,331 were colored. The Rappahannock, besides supplying it with good water, which is distributed in pipes, is valuable for its motive power, available at the falls just above. A canal extending to a point 40 m. further up the stream affords means of transportation for the products of a rich farming country, and the Richmond, Fredericksburg, and Potomac railroad connects the city with the state and federal capitals. Marble and freestone abound in the vicinity. The city has considerable trade in grain, flour, tobacco, &c., and contains a national bank, an orphan asylum, four semi-weekly newspapers, six public schools, and Baptist, Episcopal, Methodist, and Presbyterian churches. Just beyond the limits of the city an unfinished monument, begun in 1838, marks the tomb of the mother of Washington, who died here in 1789.

FREDERICKSBURG, Battle of, fought Dec. 13, 1862, between the Union forces under Gen. Burnside and the confederates under Gen. Lee. After the battle of Antietam (Sept. 16 and 17, 1862), the Union army, under Gen. McClellan, made no forward movement until late in October, when it began to cross the Potomac. The confederates meanwhile moved up the valley of the Shenandoah and into that of the Rappahannock. By Nov. 7 the two armies were within striking distance, the

federals being concentrated near Warrenton, and the bulk of the confederates near Culpeper, 20 m. S., the remainder being three days distant. The Union force was about 120,000, that of the confederates about 70,000. McClellan appears to have been disposed to attack the enemy; but the resolution came too late. On Nov. 7 he was removed from the command, which was given to Burnside, much against his wish. The capture of Richmond being considered the main object of the campaign, McClellan had proposed to make Alexandria his base of supply, and to move by the circuitous lines of railway. He indeed still preferred his former line of movement, making West Point his base; but as this plan would have again uncovered Washington, he forbore

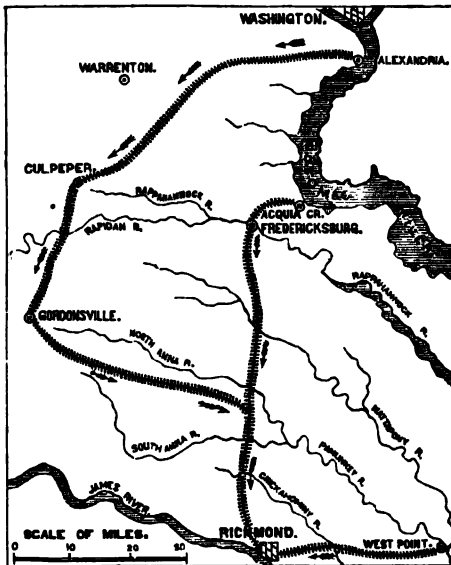


Diagram illustrating the advantages in point of distance of the three proposed routes to Richmond: that of McClellan in the spring of 1862, from West Point; that of McClellan, abandoned by Burnside, from Alexandria, by way of Culpeper and Gordonsville; and that proposed by Burnside, direct from Fredericksburg.

to urge it. Burnside proposed a plan between the two, making Aquia Creek, near Fredericksburg, his base, and moving upon Richmond by the line of the Fredericksburg railroad. If it was to be assumed that the capture of Richmond, and not the destruction of the confederate army, was the immediate object, and also that the Union army must always be interposed between the confederates and Washington, then Burnside's plan was undoubtedly the best of the three. The president, who clearly perceived that the defeat of Lee's army was the main thing to be aimed at, gave a somewhat reluctant assent to Burnside's plan. He said: "I think it will succeed if you move rapidly; otherwise not." But the movement was not rapidly made. It was not fairly commenced

until Nov. 15, by which time Lee had concentrated his whole army. The army of the Potomac had been organized into three grand divisions; the right under Sumner, the centre under Hooker, the left under Franklin. Sumner reached Falmouth, opposite Fredericksburg, on the 17th. The intention was to cross the Rappahannock and seize the heights of Fredericksburg; but the pontoons had not been provided, and the army could not cross in force. So a fortnight passed, and Lee had come up and occupied the heights. On purely military considerations no further attempt would now have been made by Burnside; but public opinion demanded an onward movement. The Rappahannock, with a general course from N. W. to S. E., makes a sharp bend southward a mile above Fredericksburg, and for some distance runs between heights on either side. Those on the east fall steeply down to the river bank; on the west the hills in the rear of the town rise about a mile from the river, and then trend away until they sink into the valley of the Massaponax, 6 m. below, leaving an irregular plain about two miles wide in its broadest part. Westward the hills rise by a succession of low wooded ridges until they are lost in the region known as the Wilderness. On the crests of these ridges lay half of Lee's army, under Longstreet; D. H. Hill was posted at Port Royal, 20 m. down the river; between them lay Jackson, ready to support either wing. Burnside resolved to cross at and near Fredericksburg, and Dec. 11 was fixed upon for the attempt. The plan was to throw three bridges across at Fredericksburg, and three more at a point about 8 m. below. Sumner's division was to cross by the upper bridges, Franklin's and a part of Hooker's at the lower, the remainder of Hooker's being held in reserve. The attempt to lay the upper bridges was opposed by a body of confederate sharpshooters, but toward evening Burnside sent over a detachment in boats, who drove out the riflemen, and the bridges were completed during the night. No serious attempt was made to prevent the construction of Franklin's bridges; they were completed by noon, and he was ready to cross, but was held back until the other bridges were built. The whole of the 12th was spent in crossing, and in preparations for the battle of the following day; a delay which gave Lee time to bring up Jackson's corps. It was no part of Lee's plan to dispute the passage of the river, as he preferred to receive the attack in his strong position. The extreme confederate left above Fredericksburg was protected by a mill pond, sluiceway, and canal, the bridges over which had been destroyed; and here the attack could be made only upon Marye's hill, which rises steeply a little behind Fredericksburg.—The morning of Saturday, Dec. 13, broke with a heavy fog resting in the valley, and shutting each army from the sight of the other. All told, Lee had now about 80,000 men, and Burn-

side had about 100,000 across the river, besides his reserve on the other side. Burnside's final order was differently understood by the different commanders. Franklin supposed that he was to make a demonstration with only one of his eight divisions. Hooker supposed that there was to be a twofold attack, the main one by Sumner. Burnside's intent was that the main assault should be made by Franklin, supported by one from Sumner, while Hooker should be ready to spring upon the enemy in his retreat. The fog lifted about 10 o'clock, and disclosed Franklin in motion. He had put a liberal construction upon his understanding of Burnside's order, and threw forward three divisions. Meade, who led the advance, pushed straight for what proved to be the centre of Jackson's position, held by the division of A. P. Hill. A considerable gap had been left at this point, and Meade struck this gap, hurling the enemy to the right and left, piercing through the first line, and reaching the second. Gibbon, who was to support him, was a little slow, and before he came up the confederates had hurried to the point assailed, and Meade found himself opposed by threefold numbers. Assailed in front and on both flanks, he was swept back in some confusion over the ground which he had won. Gibbon now came up, and for a short time checked the pursuit; but Jackson was further reinforced from Longstreet's corps, and Gibbon and Meade were forced back almost to the river. Here the confederates encountered so severe a fire that they recoiled, and fell back to their old position on the heights. This put an end to the action on the Union left. The federals here lost about 3,700 in killed and wounded; the confederates about 3,200. In the advance the federals had made about 500 prisoners, and lost as many in the retreat.—In the mean time a more severe fight had been going on 3 m. to the right, where Sumner had assaulted the foot of Marye's hill. The strength of this position was wholly unknown to the assailants, and it was not till long after that they learned why it was that they were unsuccessful. Kershaw, one of the confederate generals, is the only one who gives any full account of it. He says: "Marye's hill, covered with batteries, falls off abruptly toward Fredericksburg to a stone wall which forms a terrace on the side of the hill and the outer margin of a road which winds along the foot of the hill. This road is about 25 ft. wide, and is faced by a stone wall about 4 ft. high on the city side. The road having been cut in the side of the hill in many places, this last wall is not visible above the surface of the ground." This sunken road was like the ditch of a fortress, affording complete protection to the troops in it. About 2,000 men occupied it, standing four deep. The crest of the hill was crowned by a battery of 11 12-pounders, and about 50 heavier guns were placed so as to enfilade all the approaches, which must be made over an open plain about 350 yards wide.

The bulk of Lee's artillery was posted on the ridges in the rear, and out of action. Lee himself does not seem to have been aware of the existence of this sunken road, which actually formed the strength of his position here. He seems to have assumed that the enemy would gain the crest of the hill, and that the real battle would be fought on the plateau beyond; while Burnside assumed that when the crests were gained the battle would be won. The attack was made here by the two divisions of French and Hancock, French in the advance. His men moved across the narrow plain, galled by a fire from the confederate batteries. Half way across they came within range of the men in the sunken road, who poured in a solid sheet of musketry fire, before which the heads of the columns melted away, and the whole fell back, leaving half of their numbers behind. Hancock now advanced, until he came within range of the musketry from the sunken road. The front was so narrow that only a single brigade could be put in at once. Brigade after brigade took the places of those which had been driven back, so rapidly that this action, which lasted three hours, as seen from the heights of Falmouth, looked like a single continuous assault. French and Hancock brought 10,000 men into action, of whom 4,000 were cut down. Burnside had watched this action from the heights across the Rappahannock, and had seen the troops which were to carry the hill swept back from its base. Still he was determined that the heights should be carried, and he ordered Hooker to renew the attempt. Hooker crossed the river, examined the position, consulted with the officers who had been engaged, and returning remonstrated against the order. But Burnside was inflexible. Of his six divisions Hooker had but two with him. It was nearly night when he opened fire with all his artillery, hoping to make a breach; but this sunken road was not to be touched by any fire. At sunset he ordered the division of Humphreys to charge with unloaded muskets, for there was no time to load and fire. As it happened, the confederate battery on the hill had exhausted its ammunition and gone to the rear to replenish, so that Humphreys was not exposed to the artillery fire by which French and Hancock had been so sorely galled, and his men went a few yards further than the others had gone. But they also met a solid sheet of fire from the sunken road, which drove them back. The assault lasted only a quarter of an hour, but in those few minutes, out of 4,000 men, nearly half fell, while it is doubtful whether the enemy lost a man. Hooker forbore to press the unavailing assault. "Having," he said, "lost as many men as my orders required me to lose, I suspended the attack, and directed that the men should hold for the advance line a ditch which would afford shelter." The confederates lay upon their arms all that night, fully expecting another attack in the morning; for, says Lee, "the attack had been so easily re-

pulsed, and by so small a part of our army, that it was not supposed the enemy would limit his efforts to one attempt, which, in view of the magnitude of his preparations and the extent of his forces, seemed to be comparatively insignificant; but we were necessarily ignorant of the extent of his losses." Burnside was indeed inclined to renew the action on the following day, but finally forbore, yielding to the representations of the majority of his generals. He was still uncertain whether to hold Fredericksburg or to recross the river, and all through Sunday and the greater part of Monday the two armies lay in sight of each other, each expecting and wishing to be attacked, but neither choosing to venture upon the offensive. Toward night of the 15th Burnside decided to recross, and under cover of a storm which had set in the troops went over, the pontoons were swung back, and the river again separated the two armies.—According to official reports, the confederate loss was 595 killed, 4,061 wounded, 653 missing; in all, 5,809. The Union loss was reported by the medical inspector general just after the battle to have been 1,153 killed, 9,101 wounded, 3,284 missing; in all, 13,487. But, he adds, "the return of killed may be too small." About 1,200 of those originally reported as missing came back to their commands, reducing the number of missing to about 2,000. Lee asserts that he took about 900 prisoners, leaving about 1,100 of the federal missing to be accounted for. Of these probably about 350 should be added to the number reported as killed; so that in round numbers the Union loss was 1,500 killed, 9,100 wounded, 900 prisoners, and 750 stragglers; 12,250 in all, almost two and a half times that of the confederates. The great disparity of loss was in the action on the right, at the foot of Marye's hill. In proportion to the numbers engaged, the losses in this battle were unusually large. Of Burnside's 100,000 men who crossed the river, only about 32,000 were fairly brought into action; of the confederate 80,000, only about 25,000.

FREDERICTON, a city and port of entry of New Brunswick, Canada, capital of the province and of the county of York, on the right bank of St. John river, 84 m. from the bay of Fundy, and 54 m. N. N. W. of St. John; lat. 45° 55' N., lon. 66° 32' W.; pop. in 1871, 6,006. The city stands on a low point of land formed by a bend in the river, and is nearly encircled in the rear by a range of hills. It has broad streets crossing each other at right angles, adorned with many fine gardens and shade trees, and with several elegant public buildings. Queen street is the chief business thoroughfare, and contains the principal government buildings. At the E. end is the province building, a large wooden structure, in which the legislature and supreme court meet, containing a fine library. Near by are the various public offices. At the W. end is the government house, a fine stone structure, the residence of the lieutenant governor. On the N.

side of the street are the county court house and city hall, large brick buildings, and the barracks, of stone, capable of accommodating a regiment of infantry. In York street are the depot of the Fredericton railroad and the skating rink, and in Westmoreland street the exhibition building, of wood, covering nearly an acre. Other public buildings worthy of mention are the county jail, the custom house, and Christ church, cathedral (Episcopal), of stone, a fine specimen of church architecture. The river is here three fourths of a mile wide, and is naturally navigable to this point by vessels of 120 tons; light steamers can ascend to Grand Falls, 140 m. above Fredericton. The city became a port of entry in 1848, was incorporated in 1849, and is now the chief entrepot

Christ Church, Cathedral.

of commerce with the interior and an important station of passenger travel. Merchandise is principally brought up the river by steamers and schooners during the summer, but in winter there is a large traffic on the railways. In the vicinity are several large saw mills, and great quantities of lumber of various kinds are collected at Fredericton and thence exported to foreign ports. The lumber business is one of the principal sources of the wealth of the city. The Fredericton railroad connects with the European and North American railroad at Fredericton junction, 28 m. distant; and the city is also the terminus of the River du Loup or New Brunswick railway company's line. The city is lighted with gas, and contains two banks, a reading room, a telegraph office, eight churches, and four weekly newspapers. The university

of New Brunswick, a well endowed institution, with five professors, occupies a large stone building on a hill in the rear of the city. The other principal educational institutions are the provincial training and model school, and a collegiate school.—Fredericton was formerly called St. Ann's, and was made the seat of government by Sir Guy Carleton in 1785. It has suffered at times from terrible conflagrations, one of which in 1825 laid one third of the town in ashes, while another in November, 1850, was still more disastrous.

FREDERIKSBORG, a royal palace built by Christian IV. of Denmark in 1606-'20, after a plan by Inigo Jones, near the town of Hille-rød, on the island of Seeland, 22 m. N. N. W. of Copenhagen. It is a Gothic castle of red brick, covering three small islands in a little lake. The *Riddersal*, or knight's hall, has a ceiling elaborately decorated with carvings, gildings, and paintings, on which 26 artists are said to have worked for seven years. It has also a collection of portraits, and a richly ornamented chapel, in which all the late kings of Denmark have been crowned. The pulpit and altar in the last are of ebony and silver, exquisitely wrought, and containing more than 600 lbs. of the precious metal.

FREDERIKSHALD, or *Frederikshall* (formerly *Halden*), a seaport of Norway, in the province of Christiania, on the Iddefjord near its junction with the gulf of Swinesund, Skager Rack, 57 m. S. E. of Christiania, near the frontier of Sweden; pop. in 1865, 9,219. The harbor is excellent, and is accessible to the largest class of shipping. The great fire of 1759 nearly destroyed the town, but it has been handsomely rebuilt. It stands around the base of a gigantic rock, on the summit of which, 400 ft. perpendicularly over the sea, is the historic fortress of Frederiksteen, formerly of great strength. Charles XII. was killed here, Dec. 11, 1718. On the only accessible side, close under the outer walls, a monument marks the spot where the king fell. The castle was invested in 1814 by the Swedish crown prince Bernadotte, and its hopeless defence was a prelude to the almost immediate conquest of the kingdom and its union with Sweden, Nov. 4, 1814. About 3 m. E. of the town is a lake, the Fem Sø, the stream from which flows into the fiord near Frederikshald. Its waterfalls are the most picturesque in S. Norway.

FREDERIKSHAMN (Finnish, *Hamina*), a town and fortress of Finland, Russia, in the government of Viborg, on the gulf of Finland, 115 m. N. W. of St. Petersburg; pop. in 1867, 3,278. Here, on Sept. 17, 1809, the treaty between Sweden and Russia was signed by which Finland became Russian.

FREDERIKSTAD, a town and fortress of Norway, in the province of Christiania, at the mouth of the Glommen, 48 m. S. E. of Christiania; pop. in 1865, 6,833. It has manufactories of nails, buckles, fish hooks, pottery, tiles, and brandy; and the harbor is large and good.

FREDONIA, a village in the town of Pomfret, Chautauqua co., New York, on the Dunkirk, Alleghany Valley, and Pittsburgh railroad, about 3 m. from Dunkirk; pop. in 1870, 2,546. There is a spring of natural gas in the vicinity, which is used to light the village. It is the seat of a state normal school, which has a model school attached, and in 1872 had 16 instructors, 179 students, and a library of 2,025 volumes. There are 4 flour mills, a saw and turning mill, a planing mill, a foundry, 3 manufactories of carriages, 1 of patent medicines, a national bank, 3 hotels, 2 weekly newspapers, and 5 churches.

FREEBORN, a S. county of Minnesota, bordering on Iowa, drained by Shell Rock river; area, 720 sq. m.; pop. in 1870, 10,578. The surface is diversified and has a number of small lakes, and the soil is fertile. It is intersected by the Southern Minnesota railroad. The chief productions in 1870 were 538,398 bushels of wheat, 134,638 of Indian corn, 326,766 of oats, 53,814 of potatoes, 35,712 tons of hay, and 380,652 lbs. of butter. There were 3,136 horses, 4,468 milch cows, 7,173 other cattle, 5,057 sheep, and 35,023 swine. Capital, Albert Lea.

FREE CHURCH OF SCOTLAND, an ecclesiastical body originally formed by a separation from the national establishment in the year 1843. On May 18 the general assembly of the established church of Scotland met as usual in Edinburgh, the Rev. David Welsh, D. D., being the moderator, and the marquis of Bute being the representative of the queen. After prayer the moderator read a solemn protest on the part of the church of Scotland against the wrongs inflicted on her by the civil power, which protest was signed by 203 members of the assembly. He then laid the protest on the table, and bowing respectfully to the representative of royalty left the house, followed immediately by Dr. Thomas Chalmers, Dr. Robert Gordon, Dr. Patrick McFarlane, Dr. John McDonald, Dr. Thomas Brown, and rank after rank of the country ministers. The protesters withdrew to a large hall at Canon mills, preceded and followed by sympathizing crowds, and there organized the Free Protesting church of Scotland, under the moderatorship of Dr. Thomas Chalmers. It was then found that 475 ministers had separated from the national church. The amount of capital surrendered that day by the protesting brethren, in relinquishing their stipends from the establishment, was said to be at least £2,000,000.—The French revolution had considerably affected the standing both in the church and in society of the evangelical party in the church of Scotland. Their doctrines had been looked upon as tainted with fanaticism, but the general horror of infidelity awakened by the events in France caused them to be regarded with greater favor, while their impressive preaching, exemplary lives, and solid learning began to give character to the cause with which they

were identified; and though as yet a mere handful in the church, they were every day increasing in numbers and power. Under the leadership successively of Erskine, Sir Henry Moncrieff, Andrew Thomson, and Chalmers, the evangelical party became stronger and stronger, until a fair opportunity for testing the power of parties in the church occurred in 1884. In 1707 the treaty of union between England and Scotland was consummated. It contained a special guarantee for the integrity of the church of Scotland as established in 1689 under the reign of William and Mary, free from prelacy, from the royal supremacy in things spiritual, and from the law of patronage. But in 1711, four years after the consummation of the treaty of union, the British parliament violated its pledge, and under the leadership of Bolingbroke lay patronage was reimposed upon the Scottish church. Such was the sense of the wrong inflicted by this act, that the Scottish church for a long period annually renewed her protest against it; and during several years after it was passed no patron was found to appropriate the powers which it conferred upon him. Toward the close of the century, however, forced settlements of ministers upon parishes became frequent, and multitudes of the best people were driven from the church. Against such proceedings it was in vain that the evangelical party earnestly and frequently protested; their protests were those of a small minority, whose principles the majority despised and hated. But that minority grew in numbers and in power, especially from the beginning of the present century, and under such leaders as Thomson and Chalmers one abuse after another was rooted out; and at last an act was passed by the general assembly in 1834 designed to be a corrective of the evils of lay patronage, which gave to the male heads of families in every parish the right of objecting to any presentee whom the patron might wish inducted into the pastorate over them. This act, commonly called the "veto act," though proposed by Lord Moncrieff, one of the senators of the college of justice, and though believed by the church to be entirely within her power as a church established by law to enact, very soon brought her into conflict with the patrons, and through the patrons with the civil courts. On a vacancy occurring in a certain parish the patron presented his *protégé*, who was vetoed by almost the entire body of inhabitants. The presentee appealed to the civil courts, which at once commanded the presbytery to proceed to his settlement. The presbytery refused. The civil courts of course stood mainly on the interpretation of the law of 1711-'12. The evangelical party, now the majority in the general assembly, believing that law to be both unconstitutional and contrary to the word of God, resolved to abide by the decision to which they had come in 1884, viz.: that the Christian people had a

right by law and by warrant of God's word to be heard in regard to the appointment of a minister over them; and that the acts of ordaining to the ministry and of inducting into a pastoral charge were spiritual acts, in regard to which the church alone had jurisdiction. The supreme civil court of Scotland also interposed its authority against the ordination and induction of a minister. The assembly, when appealed to for advice, by a large majority authorized the presbytery to proceed with the settlement. The presbytery were threatened by the civil court with imprisonment and fine should they dare to set its interdict at defiance. The ordination and induction of the presentee were consummated, and immediately a complaint was laid against the presbytery before the civil court. They were summoned to appear before the bar of the court, June 14, 1839, which they did. The judges heard their reply, and took four days to consider the case, during which it was understood that five of the judges voted for a sentence of imprisonment, and six for a rebuke. The rebuke was accordingly pronounced, and the presbytery were dismissed from the bar with the intimation that a sentence of imprisonment would certainly be pronounced against any presbytery that should afterward be found chargeable with a similar offence. Other cases involving the same principles rapidly arose, and elements of a still more deplorable character were brought into the arena of strife. The civil court required a presbytery to take a clergyman on trial, admit him to the office of the ministry in a particular charge, and intrude him on the congregation contrary to the will of the people. It also interdicted the establishment of additional ministers to meet the wants of an increasing population. It interdicted the preaching of the gospel and all ministration of ordinances throughout a whole district by any minister of the church under authority of the church courts, as well as execution of the sentence of a church judicatory prohibiting a minister from preaching or administering ordinances within a particular parish, pending the discussion of a cause in the church courts as to the validity of his settlement therein. It also interdicted the general assembly and lower judicatories of the church from inflicting church censures: in one case where the minister was accused of theft and pleaded guilty; in another where a minister was found guilty of fraud and swindling; and in another where a licentiate was accused of drunkenness, obscenity, and profane swearing. It suspended church censures when pronounced by the church courts in the exercise of discipline, and took upon itself to restore the suspended ministers to the power of preaching and the administration of ordinances. It assumed to judge of the right of individuals elected members of the general assembly to sit therein. As a last resource, the church appealed to the parliament of Great Britain. Her "claim of

rights," carefully prepared, was presented to the house of commons, March 7, 1843, by the Hon. Fox Maule (now earl of Dalhousie, and a ruling elder and a member of the general assembly of the Free church); but it was refused by a majority of 211 against 76. Of 37 Scottish members present at the division, 25 voted for Mr. Maule's motion. The question now was: Will the church retire from her declared principles, or will she, to preserve her liberties, relinquish her connection with the state? Without hesitation the decision was made, and 475 ministers left the establishment, including most of those who had acted openly with the evangelical party. Many of the congregations also left it whose ministers remained in it; and hence, as well as from the continued accession of numbers in every district of the country, the number of churches now exceeds 900. The missionaries belonging to the establishment in 1843 to a man threw in their lot with the Free Protestant church. Her ministers are supported out of a common fund, to which every member of the church is expected to contribute according to his ability, and the dividend accruing from this fund every congregation is at liberty to supplement at its pleasure. In 1872 the church had 16 synods, 71 presbyteries, 948 congregations, and 957 ministers. The sum of £432,623 was in the same year raised for the various purposes of the church, including missions. Although beginning with nothing in 1843, and undertaking the untried work of supporting the ministry, the Free church has built or purchased all its churches throughout Scotland, with the manse and the parish school houses, the missionary buildings in India, Africa, and elsewhere, the buildings of the two normal schools in Edinburgh and Glasgow, the three colleges at Edinburgh, Aberdeen, and Glasgow, and the new assembly hall in Edinburgh, erected in 1858-'59 at a cost of £6,000. For the education fund she raised in 1848-'4 £2,542, and in 1869-'70 £8,894. The average salary of the ministers is £205, besides manse and glebe.

FREEDMEN (*liberti*, *libertini*), the designation of manumitted slaves in Roman antiquity. They were called *liberti* with reference to their masters, and *libertini* with reference to their new rank or condition. According to various circumstances, defined by law, the freedmen became Roman citizens, Junian Latins (from the Junian law which gave them freedom, and the similarity of their status to that of Latin colonists), or *dediticii*. The last were neither citizens (Roman or Latin) nor slaves. The Junian Latins suffered great disabilities as to property, but could in various ways rise to citizenship. But even the freedmen of the first class were not genuine (*ingenui*) citizens, and remained under certain obligations to their masters. The freedmen wore a cap as a sign of freedom, and took the names of their previous owners. The sons of freedmen became genuine citizens. In later times the number

of manumitted slaves increased to an alarming extent, and some of the emperors passed laws restricting manumission. (See SLAVERY.)—In the United States the term denotes the colored people emancipated by the civil war. Soon after its commencement, and especially after the issuing of the proclamation of emancipation by President Lincoln, Jan. 1, 1863, large numbers of slaves abandoned by or escaping from their masters came within the federal lines. The duty of caring for these helpless people was devolved first upon the war department, and afterward upon the treasury department. They were supplied with food and clothing, and were largely employed in the work of fortification, and in other labor in aid of the army. Plantations abandoned by their owners were also set apart for the use of freedmen, which they occupied in some cases on their own account, but generally as employees of the government or of individuals to whom the abandoned lands were leased. Enlisted in the federal army to the number of 186,097 during the war, the colored soldiers proved themselves unsurpassed in bravery and aptitude for military life. Various charitable and religious organizations at the north did much for the education of the freedmen, for which they manifested an intense desire, by organizing schools and employing teachers. At the close of the war the late slaves flocked to the cities and principal towns, and large numbers were dependent upon the government for transportation to points where work could be obtained, while an active supervision was necessary to protect their rights from the encroachments of their former masters, and to prepare them for a life of freedom. To enable the government to fulfil these duties, the act of congress of March 3, 1865, was passed, organizing in the war department the "bureau of refugees, freedmen, and abandoned lands," popularly known as the "freedmen's bureau," which, with powers enlarged by subsequent acts, remained in operation until Jan. 1, 1869, when its functions ceased, with the exception of the educational department, which continued till July 1, 1870, and that for the collection of claims, which is still in operation. It was placed in charge of Maj. Gen. O. O. Howard as commissioner, with 10 assistant commissioners, aided by various subordinates, in the late insurrectionary states. It exercised a general supervision over the freedmen as well as over loyal refugees, protecting them in their rights, deciding their disputes, aiding them in obtaining work, extending to them facilities of education, and furnishing them with medical treatment. The collection of the claims of colored soldiers and sailors for pay, bounty, prize money, &c., by which they were protected from fraud, was an important function of the bureau. The number of day and night schools making regular reports in operation at the close of each school year (June 30), with the number of teachers and pupils, is shown in the following table, besides which

there were Sunday schools, industrial schools, and many day and night schools making only occasional reports to the bureau:

YEARS.	DAY AND NIGHT SCHOOLS.			Number of pupils in schools of all kinds.
	Number.	Teachers.	Pupils.	
1866.....	975	1,405	90,778	150,000
1867.....	1,889	2,067	111,442	238,842
1868.....	1,881	2,295	104,827	241,819
1869.....	2,118	2,455	114,522	250,000
1870.....	2,089	2,568	114,516	247,883

Of the number reported in 1867, 428 were night schools, 555 were wholly and 501 partly sustained by freedmen, who owned 391 school buildings, and 471, including 21 high and normal schools, were graded. Of the teachers 1,888 were white and 699 colored. The whole number of schools of all kinds was 3,675, including 1,468 Sunday schools with 105,786 pupils, and 35 industrial schools with 2,124 pupils. The total expenses for the six months ending June 30 were \$527,866, of which \$87,832 were paid by freedmen and \$220,838 by the bureau. Of the number reported in 1870, 1,824 were sustained wholly or partly by freedmen, who owned 592 school buildings, and 74, with 8,147 pupils, were high or normal schools. Of the teachers 1,251 were white and 1,812 colored. The whole number of schools of all kinds was 4,289, with 9,307 teachers, including 1,562 Sunday schools with 6,007 teachers and 97,752 pupils, and 61 industrial schools with 1,750 pupils. The whole amount expended for schools for the six months ending June 30 was \$1,002,896, of which \$200,000 were paid by freedmen and \$442,896 by the bureau. The total expenditure of the bureau for educational purposes to Aug. 31, 1871, was \$3,711,264, the greater portion of which was for the erection and renting of school buildings. The bureau aided in establishing a large number of institutions for the higher education of the freedmen, many of which have continued in operation to the present time. Among these may be mentioned Howard university, at Washington; Atlanta university, at Atlanta, Ga.; Claflin university, at Orangeburg, S. C.; Straight university, at New Orleans, La.; Fisk university and the Central Tennessee college, at Nashville, Tenn.; Wayland seminary (theological), at Washington; and the Hampton normal and agricultural institute, at Hampton, Va. Nearly 800,000 acres of farming land and 5,000 pieces of town property, afterward restored to the owners, were at various times under the charge of the bureau, and the rents collected amounted to \$400,000. The number of rations issued to freedmen was over 15,000,000; number of freedmen furnished with transportation, about 30,000; number of sick, including refugees, treated, 590,000. The amount of claims collected and paid over to Aug. 31, 1871, was \$8,418,051. The bureau was supported mainly by congressional appropriations, though

the receipts from certain miscellaneous sources, including the sale and rental of confederate property, fines, marriage certificates, donations, &c., known as the freedmen's and school funds, were set apart for its benefit. The total expenditure to Aug. 31, 1871, including accounts in favor of the freedmen from Jan. 1, 1865, was \$14,996,480, of which \$1,910,355 were derived from the freedmen's and school funds.

FREEMAN, Edward Augustus, an English author, born at Harborne, Staffordshire, in 1823. He was educated at Trinity college, Oxford, where he filled the office of examiner in law and modern history in 1857-'8 and in 1863-'4. He has published "History of Architecture" (1849); "Essay on Window Tracery" (1850); "Architecture of Llandaff Cathedral" (1851); "History and Conquest of the Saracens" (1856); "Ancient Greece and Mediæval Italy" (in "Oxford Essays" for 1858); "History of Federal Government" (vol. i., 1863); "History of the Norman Conquest," his chief work (4 vols., 1867-'72, to be completed by a fifth volume); "Old English History" (1869); "History of the Cathedral Church of Wells" (1870); "Historical Essays" (1871; 2d series, 1873); "Growth of the English Constitution" (1872); and "Comparative Politics" (1873).

FREEMAN, James, an American clergyman, born in Charlestown, Mass., April 22, 1759, died in Newton, Nov. 14, 1835. After graduating at Harvard college in 1777, he went to Quebec, returned to Boston in 1782, and became reader at the King's chapel in Boston, an Episcopal church. Becoming Unitarian in his views, he induced the society to alter their prayer book in 1785, and in 1787 he was ordained by his own wardens and people by a peculiar service. He continued rector of King's chapel for 48 years, till his death. He was one of the founders of the Massachusetts historical society, and was the first minister in the United States who openly assumed the name of Unitarian, while through his means the first Episcopal church in New England became the first Unitarian church in America. A volume of his "Sermons and Charges" was published in 1832.

FREEMASONRY, the system of secrets, ceremonies, and principles peculiar to the order or society of freemasons. This order, as it now exists, is a secret association organized for the purpose of social intercourse and mutual assistance. A very ancient origin is often claimed for it, some of its writers maintaining that it derived its origin from the "Dionysiac fraternity," an association which was formed in Asia Minor by the architects and builders engaged in the construction of temples and theatres at the time when the Greeks migrated from Attica thither. The association is supposed to have been in existence in Tyre when Solomon undertook the building of the temple, and the story runs that the fraternity sent a band of workmen from Tyre to assist Solomon in that work. Freemasonry, according to this account,

is said to have been originally organized by the leader of the band, who was a widow's son; and in this way is explained the great prominence which is given to Solomon's temple in the ritual and symbols of the order. But as there is no trace of these legends in authentic history, well informed masons content themselves with supposing that the order originated in the associations which were formed during the middle ages by masons and builders, as well as by workmen belonging to other crafts. In those times, when a church or other great edifice was in process of construction, workmen were collected from all quarters and encamped in huts around it. They established a regular government with a master at their head, and appointed every tenth man a warden to oversee the others. They ranged from country to country, and established themselves wherever they found churches to build. It thus became important for them to be able to make themselves known to each other in strange countries, and hence they devised a system of secret signs and symbols. Whether these associations were also in possession of secret knowledge which was essential in architecture, and was transmitted from one generation to another, is a disputed point. It is certain that the finest monuments of Gothic architecture both in France and England were reared by architects who were not members of the order. The building of churches, however, was the great work of the times, and the masonic associations were held in high esteem because of the importance of their services in this work. They enjoyed the especial favor and protection of the pope, and bulls were issued by which peculiar privileges were granted to them. They were exempted from burdens imposed upon other workmen, and hence were styled "free" masons. Men of eminence, both ecclesiastics and laymen, who were not actually employed in building, either as architects or as masons, became members of the order. Henry VI., king of England, joined it, and Henry VII. was grand master.—Freemasonry, as organized at the present day, has no connection whatever with the art of practical building. It is called by masonic writers speculative masonry, to distinguish it from practical building, which is called operative masonry. According to these writers, as the number of persons not practical builders who were admitted to the order increased, operative masonry was gradually transformed into speculative. They refer to the initiation in 1646 of the English antiquary Elias Ashmole, of which a description is found in his diary, as evidence that at that time the operative character of freemasonry was fast giving way to the speculative. On the other hand, writers who do not belong to the order maintain that modern freemasonry never had any connection whatever with the freemasonry of the middle ages, but was originally founded by Ashmole and some of his friends, as a piece of mystification, its symbols and signs having been

borrowed partly from the knights templars and partly from the Rosicrucians. However this may be, it is certain that an order of freemasons was in existence in London after the great fire of 1666, and that Sir Christopher Wren was appointed grand master of it. The interest in it afterward declined, perhaps because it was neglected by Wren as he became old and infirm; so much so that at the beginning of the 18th century St. Paul's lodge was the only one, or almost the only one, in existence in England. In 1702 this lodge adopted a regulation by which it was provided that the privileges of masonry should be extended to men of various professions, provided they were regularly approved and initiated into the order. The four lodges in existence in 1717 assembled at the Apple Tree tavern, in Covent Garden, and constituted themselves the grand lodge of England. The union was formed on the basis of the regulation of 1702. Since that time freemasonry has been, as it is called, a purely speculative system of symbolism. In 1723 the grand lodge adopted a constitution framed by Anderson, which became the organic law of the order. As thus organized, it was transplanted from England into France in 1725, into Ireland in 1729, and within the next ten years into Holland, Russia, Spain, Italy, Scotland, and Germany. An attempt was made in 1780 to introduce the organization into America by the appointment of a provincial grand master of New Jersey, but we have no record of the incumbent having established any lodge under the authority of his deputation. In 1733, however, a lodge was opened at Boston, which was speedily followed by the organization of other lodges in the different colonies. After the assumption of independence by the United States, the lodges of America, all of which derived their warrants of authority originally from the grand lodge of England or that of Scotland, availed themselves of the privileges possessed by such bodies in all independent countries, and organized grand lodges in their respective states. In no country in the world has freemasonry flourished with more vigor than in the United States; and notwithstanding a severe but ineffectual opposition to it, which commenced in 1829 by the organization of an anti-masonic party (see ANTI-MASONRY), it has increased in numerical extent with such steady progress that at the present day it numbers, in all parts of the republic, several thousand lodges, and more than half a million members. In the whole world there were in January, 1878, upward of 10,000 lodges, and probably a million freemasons, including in that term not merely active members of lodges, but all who have attained the degree of master mason. In spite of many attempts to suppress it by both church and state in various countries of Europe, it is firmly planted in every part of that continent, and many lodges have been established in Africa and Asia. In May, 1878, a lodge was established by Americans in the

city of Jerusalem; and in the preceding year the grand lodge of Italy was opened in Rome itself. Its organization in Europe has been frequently used for political purposes, and especially as a cloak to conspirators against the governments. Such employment of it, however, is a violation of its constitution, which prohibits political, partisan, or sectarian discussions in the lodges.—The primary organization of the masonic fraternity is into lodges, which must each be composed of at least seven master masons in good standing. The first and lowest degree of masonry is that of entered apprentice, the second of fellow craft, the third of master mason. The officers of a lodge in the United States are: worshipful master, senior warden, junior warden, treasurer, secretary, senior deacon, junior deacon, tiler, and chaplain. There are also two stewards. The master, the wardens, and the tiler are essential to any lodge organization. The tiler keeps the door and guards against intrusion. The officers are elected annually by ballot. In each state of the Union there is a grand lodge composed of the representatives of the subordinate lodges, over which it exercises a certain jurisdiction. Its officers are styled grand and deputy grand masters, grand wardens, grand treasurer, grand secretary, grand chaplain, grand deacons, grand marshal, grand pursuivant, grand sword-bearer, grand stewards, and grand tiler. There is also a still higher degree of masonry, the members of which are termed royal arch masons, and form royal arch lodges; and beyond this there is still a long series of degrees bearing various titles.—The literature of freemasonry is extensive, especially in the German and French languages, the latest *bibliographia masonica* containing titles of quite 4,000 books upon the history, rituals, and belles-lettres of the order. Among the American works best known are Mackey's "Lexicon" (Philadelphia, 1850); Morris's "Lights and Shadows" (1852), "Poems" (1864), and "Dictionary" (1867); and McCoy's "Cyclopedia" (1868). Webb's "Freemason's Monitor" (1796), in numerous editions, is still the favorite text book of the craft. "Freemasonry in the Holy Land" (1872) describes the masonic mission which led to the organization of the lodge in Jerusalem.

FREEPORT, a city and the capital of Stephenson co., Illinois, on the Pekatonica river and at the intersection of the Western Union railroad with the Galena division of the Chicago and Northwestern, and the Northern division of the Illinois Central line, 108 m. W. N. W. of Chicago; pop. in 1850, 1,436; in 1860, 5,376; in 1870, 7,889. It is situated on a fertile and undulating tract of land, and contains one of the finest court houses in the state. The principal manufactures are one of reapers and wagons, one of churns, one of carpets and coverlets, a machine shop and foundry, a planing mill and pump factory, a woollen mill, a turning shop, and a tannery. There are two national banks, with a capital of \$200,000,

three weekly newspapers (one German), two monthly periodicals, 18 churches, and 20 public schools (in 1872), including a high school, with 25 teachers and 1,400 pupils. Freeport college (Presbyterian) was organized in 1872, with 10 professors and instructors and 60 students. Freeport was first settled in 1835.

FREESOILERS, the name of a political party in the United States, founded upon the principle of non-extension of slavery to the territories. It was an outgrowth of the liberty party in 1846, and was merged in the republican party in 1856. The immediate cause of its establishment was the acquisition of new territory at the conclusion of the Mexican war. In 1846, to a bill in congress making an appropriation to negotiate a peace with Mexico, David Wilmot, a democratic representative from Pennsylvania, offered an amendment, known as the Wilmot proviso, "that there shall be neither slavery nor involuntary servitude in any territory on the continent of America, which shall hereafter be acquired by or annexed to the United States by virtue of this appropriation, or in any other manner whatsoever, except for crime," &c. It was carried in the house, but failed in the senate, and in the next session was defeated in both branches. Peace with Mexico, however, and the consequent acquisition of territory, made the Wilmot proviso of political and practical importance. In both the whig and democratic national conventions in 1846 there were delegates from the northern states who attempted to introduce into the party platforms of that year resolutions prohibiting the extension of slavery to the territories. The rejection of these resolutions led to the secession of a considerable number of prominent men from both parties, especially in Massachusetts, New York, and Ohio. In New York seceding democrats were termed "barn-burners," and their secession was partly on personal as well as on anti-slavery grounds. The seceders from both parties united, and sent delegates from all the free states, and from Delaware, Maryland, Virginia, and the District of Columbia, who met in convention at Buffalo, N. Y., Aug. 9, 1848, and formed a freesoil party. They nominated for president and vice president of the United States Martin Van Buren and Charles Francis Adams. In November following this ticket received a popular vote of 291,000, but did not secure a single electoral vote. The second national convention of the freesoil party, at Pittsburgh, Pa., Aug. 11, 1852, comprised delegates from all the free states, and from Delaware, Maryland, Virginia, and Kentucky, and nominated for president and vice president of the United States John P. Hale and George W. Julian, who in the election following received a popular vote of 157,000. The so-called compromise measures of 1850 and the repeal of the Missouri compromise in 1854, by the Kansas-Nebraska act, with the political agitation following, for a time gave great prominence to the platform and princi-

ples of the freesoil party. It formed the nucleus of the republican party, which was founded in 1856 chiefly from the dissolving whig party. The adoption by the republicans of the freesoil platform in respect to slavery ended the freesoilers as a distinctive party.

FREESTONE, an E. central county of Texas, bounded E. by Trinity river and intersected by Pecan creek; area, 900 sq. m.; pop. in 1870, 8,189, of whom 3,368 were colored. It is heavily timbered. The soil is fertile and well watered. Mineral springs exist. The chief productions in 1870 were 197,431 bushels of Indian corn, 26,015 of sweet potatoes, and 6,465 bales of cotton. There were 3,640 horses, 4,931 milch cows, 14,539 other cattle, and 18,489 swine. Capital, Fairfield.

FREE THINKERS, a name applied to the opponents of Christianity in England in the 17th and 18th centuries. Lord Herbert of Cherbury, Hobbes, Toland, Tindal, Woolston, Chubb, and Anthony Collins were among their most noted writers. Bolingbroke, Shaftesbury, and David Hume were counted among their ablest representatives. They were never an organized sect. The French writers, including Voltaire, D'Alembert, Diderot, and Helvétius, who labored for the overthrow of Christianity, and who called themselves *esprits forts*, were in England called free thinkers.

FREETOWN, a town of W. Africa, capital of the British colony of Sierra Leone, on the left bank of Sierra Leone river, about 5 m. from the sea; lat. 8° 29' N., lon. 13° 9' W.; pop. estimated at 18,000. It is on an inclined plane, 50 ft. above sea level at high-water mark. The streets are wide, well laid out, and ornamented with rows of orange, lime, banana, or coconut trees. Several of the houses are commodious and substantial stone buildings. The principal public edifices are St. George's church, the church missionary and Wesleyan missionary institutions, the grammar school, market house, custom house, jail, and lunatic asylum. The governor's residence, barracks, and government offices are on hills above the town. The navigable entrance of the Sierra Leone river is narrow, there being a large shoal called the Bullom shoal in its centre.

FREEWILL BAPTISTS, or *Free Baptists*, a denomination of evangelical Christians in the United States and Canada. Its founder was Benjamin Randall (1749-1808), who was one of Whitefield's hearers at Portsmouth, N. H., Sept. 28, 1770. The impression made by the sermon, and more especially by the tidings of the preacher's death two days later, resulted in his conversion. At first a Congregationalist, he connected himself in 1776 with the Baptist church in South Berwick, Me., and soon after entered the ministry, but was called to account for preaching a doctrine different from that of his brethren. In 1780 he organized in New Durham, N. H., a church holding views similar to his own, which was the nucleus of the new denomination. The distinctive tenets of

Randall and his coadjutors were the doctrines of free salvation and open communion, as opposed to those of election and close communion held by the Calvinistic Baptists. They also insisted upon the freedom of the will, as essential to man as a subject of moral government, and therefore as inviolable by the divine sovereignty, and not to be contravened by any explanation of it. Their opponents styled them "General Provisioners," "Freewill Baptists," and "Free Baptists," by the second of which names they have usually been designated, though the last is now preferred in some of their own publications. In government they are congregational. The first church held a conference once a month, which was called a monthly meeting. When other churches were formed in neighboring localities, a general quarterly meeting by delegation was held. As Randall and his associates travelled and extended the denomination through New Hampshire and the adjacent states, numerous quarterly meetings were organized, and yearly meetings were instituted, consisting of delegates from associated quarterly meetings. The organization was completed by the institution in 1827 of the general conference, composed of delegates from all the yearly meetings, which convenes once in three years. To all these bodies the laity and clergy are alike eligible, and they all combine the services of public worship with the discussion and decision of questions of business and benevolence. In 1827 a correspondence was opened between the Freewill Baptists of New England and a few churches in North Carolina of similar sentiments, the result of which was that the latter in 1828 published their records as the "Minutes of the Freewill Baptist Annual Conference of North Carolina." They soon numbered 45 churches and about 3,000 members, and, though never formally united with the denomination in the north, maintained a constant correspondence with it. In 1839 Dr. William M. Housley of Kentucky, once a close communion Baptist clergyman, who for doctrinal reasons had taken a letter of dismission and commendation from his former connection, attended the general conference of the Freewill Baptists at Conneaut, Ohio, and there applied for ordination to the ministry. He had already been admitted to the church in that place. There was a prospect of a large accession to the sect from Kentucky, and a council reported that Dr. Housley had approved himself qualified for the sacred office, excepting only that he was a slaveholder. But for this reason alone the council declined to "ordain him as a minister or fellowship him as a Christian," and the general conference after a spirited discussion voted without opposition "that the decision of the council is highly satisfactory." The connection of the denomination with slaveholding churches in North and South Carolina was brought before the same conference, and was entirely dissolved. From that

time the Freewill Baptists maintained the position then taken on the question of slavery, and the work of the denomination was confined mostly to the northern states until after the abolition of slavery. Since then much effort has been expended in educating the freed people and gathering them into churches. In Louisiana and in the Shenandoah and Mississippi valleys schools have been established and churches organized, and with the latter about 4,000 colored people have united. Some of the white churches in the south, holding similar views of doctrine and polity, have entered into correspondence that looks toward a formal union. There are several benevolent societies of denominational interest, supported and encouraged by all the churches. The principal of these are the foreign and home mission societies, and the educational society, and by all of them an aggregate sum averaging about \$80,000 is raised annually. They celebrate anniversary meetings together in the autumn, which are numerously attended. The foreign mission society has several stations in Orissa, India. The Freewill Baptists have recently given special attention to the interests of education, and since 1847 have raised nearly \$1,000,000 for educational purposes. They have a flourishing college at Lewiston, Me., and another at Hillsdale, Mich., to which pupils of both sexes and all colors are admitted, a theological department in each of these institutions, and seminaries of high grade and repute in eight or ten different states. The denominational printing establishment is at Dover, N. H., where are published the "Morning Star," which for nearly 50 years has been the weekly organ, and a variety of denominational, Sunday school, and miscellaneous books. Biographies have been published of Randall, Colby, Marks, Phinney, Martin Cheney, and other clergymen, which throw light upon the history and spirit of the denomination. A history of the Freewill Baptists is in preparation under the direction of the general conference, one volume of which has been issued. In 1800 the whole number of communicants was less than 8,000. In 1829, when complete returns were for the first time obtained, there were 8 yearly meetings, 22 quarterly meetings, 311 churches, 268 ministers, and 12,860 communicants. There are now (1874) 35 yearly meetings, 161 quarterly meetings, 1,504 churches, 1,269 ministers, and 70,576 communicants. They are found in nearly all the states, but are most numerous in New England. There is also in New Brunswick and Nova Scotia a separate and rapidly increasing conference of Free Baptists, having about 9,000 members, who are not included in the above computation. They have a weekly newspaper, the "Religious Intelligencer," published at St. John, N. B. The Freewill Baptists hold correspondence by letters and delegations with the General Baptists of England, with whom they agree in doctrine.

FREEZING, Artificial, the reduction of the temperature of fluids to such an extent as to render them solid. It is usually applied to the freezing of water and of articles of food. There are two general methods of effecting artificial freezing, viz., by liquefaction and by vaporization and expansion. The method by liquefaction is performed by freezing mixtures, which are formed by mixing together two or more bodies, one or all of which may be solid. They are generally used in vessels having three or four concentric apartments: an inner one, containing the article to be frozen; one eccentric to this, containing the freezing mixture, provided with some contrivance for agitation; one again outside of this, filled with a non-conductor of heat, as powdered charcoal, gypsum, or cotton wool; and sometimes one between them for holding water. The following table contains a list of the more important freezing mixtures, with the reduction of temperature each is capable of effecting:

SUBSTANCES.	Parts by weight.	Reduction of temperature.
Snow or powdered ice.....	2	50° to 0° F.
Common salt.....	1	
Sulphate of soda.....	8	
Hydrochloric acid.....	5	50° to 1-5°
Sulphate of soda.....	5	
Nitrate of ammonia.....	6	
Dilute nitric acid.....	4	50° to -14-50°
Phosphate of soda.....	9	
Dilute nitric acid.....	4	
Snow or powdered ice.....	8	50° to -20°
Crystallized chloride of calcium...	4	
		82° to -54-4°

The method of freezing by vaporization and expansion depends upon principles explained in the articles **BOILING POINT**, **EVAPORATION**, and **HEAT**. Among the most efficient apparatus for conducting the process is that of M. Carré of France. A strong galvanized wrought-iron boiler, capable of sustaining a pressure of eight or ten atmospheres, is connected by a tube with a freezer, also made of galvanized iron and of corresponding strength, consisting of two compartments, an outer annular one, connected with the boiler, and an inner one, for receiving the vessel which contains the water or liquid to be frozen. The connection between the boiler and freezer may be controlled either by stopcocks or by self-acting valves. A saturated solution of ammonia is introduced into the boiler, and the freezer is placed in a cold bath. Heat sufficient to produce a pressure of five or six atmospheres is applied to the boiler, which expels the gas from the water in which it is dissolved, and forces it into the annular compartment of the freezer, where it is condensed by its own pressure, aided by the cool bath, along with about one tenth its weight of water. When sufficient ammonia has been condensed, which is shown by the pressure indicated by a gauge, or approximately by a thermometer, the boiler itself is placed in a cold bath; the cylinder con-

taining the water to be frozen is placed in the inner compartment of the freezer, and to insure contact the interstice is filled with alcohol. As the boiler cools, the pressure which had been produced by heat is gradually removed, and the liquid ammonia in the freezer becomes vaporized, producing an intense degree of cold. In a little more than an hour a block of ice may be frozen. An apparatus in use is said to be capable of producing 800 lbs. of ice in an hour.

FREIBERG, or *Freyberg*, a walled town of Saxony, on the N. declivity of the Erzgebirge, and on the river Münsbach, 19 m. S. W. of Dresden; pop. in 1871, 21,673. It is a well built town, containing handsome monuments to Maurice of Saxony, and to Werner, the mineralogist, and a fine Gothic cathedral. The mining academy, founded in 1765, has a museum of model mining machines, and a library of about 20,000 volumes. It is one of the best mining schools in the world, and in 1878 had 86 students from nearly all countries, including 16 from the United States. The town has also a gymnasium and a commercial school. The staple manufactures consist of gold and silver lace, brassware, white lead, gunpowder, shot, iron and copper ware, linens, woollens, ribbons, tape, leather, and beer. Freiberg is an ancient city, and was long the residence of the Saxon princes. It has mines of silver-bearing lead, which have been worked since the 12th century. The richest veins have been driven so deep that their productiveness has diminished on account of the accumulation of water. For the purpose of draining them, a tunnel through the mountains to the Elbe at Meissen, distant 24 m., has been commenced. The district contains 150 mines, yielding silver, lead, copper, cobalt, and other minerals, employing in 1878 about 1,800 persons; the aggregate value of the products amounted in the same year to 4,000,000 thalers.

FREIBURG (Ger. *Freiburg im Breisgau*), a city of Germany, in the grand duchy of Baden, capital of the circle of the Upper Rhine, in the old district of Breisgau, on the Dreisam, 72 m. S. S. W. of Carlsruhe, and 82 m. N. E. of Basel; pop. in 1871, 24,599. It is 940 ft. above the level of the sea, on the outskirts of the Black Forest, at the mouth of the Höllenthal. The town was several times captured by the French, who in 1744 destroyed its fortifications, and in their place public walks and vineyards have been laid out. The streets are in general open and well built, particularly the Kaiserstrasse, which is remarkable for its width and the excellence of its houses. Since 1827 the town has been the seat of the archbishop of the ecclesiastical province of the Upper Rhine. In 1454 a university was founded here, which has a library of more than 100,000 volumes, and in 1878 had 50 professors and 275 students. It has a faculty of Catholic theology. The principal public edifices are the archiepiscopal and ducal palaces; the cathedral,

one of the most beautiful and perfect specimens of Gothic architecture in Germany; the government offices, courts of justice, town hall, museum, theatre, gymnasium, orphan asylum,

The Cathedral of Freiberg.

hospitals, and seminaries. The corner stone of a new Protestant church was laid April 7, 1874. The manufactures include leather, paper, sugar, starch, tobacco, soap, bells, musical instruments, and chemicals. The Basel and Mannheim railway passes through Freiburg.

FREIBURG, a town and a canton of Switzerland. See **FRIBOURG**.

FREIBURG UNTER FÜRSTENSTEIN, a town of Prussia, in the province of Silesia, on the Polnitz, 85 m. W. S. W. of Breslau; pop. in 1871, 6,792. The principal establishment is a flax spinnery, but there are also manufactories of woollen and cotton goods and tobacco, distilleries, lime kilns, and tile works. The town is surrounded by walls, with three gates, and has three suburbs. In the vicinity is the extensive domain of Fürstenstein, with the old and modern castles of that name, the latter built in mediæval style and celebrated for its picturesque situation.

FREIGHT. See **SHIPPING**.

FREILIGRATH, *Ferdinand*, a German poet, born in Detmold, June 17, 1810, died March 18, 1876. After leaving the gymnasium, he became a mercantile clerk at Soest, Amsterdam, and Barmen. His first productions were published in the *Musen Almanach* in 1838. He brought out a volume of poems in 1838, which was so

favorably received that he gave up his situation, and removed to Darmstadt. In 1842 he received from the king of Prussia a pension of \$300, and removed to St. Goar on the Rhine. The liberal party, with whom he was strongly allied in sentiment, being offended at his acceptance of a royal pension, he gave it up in 1844, and in that year his *Glaubensbekenntnisse* ("Confession of Faith") subjected him to political persecution which drove him abroad. He went to Belgium, to Switzerland, and finally to England, where German merchants gave him employment. In 1848, on the invitation of Longfellow, he had engaged a passage to the United States, when the revolutionary movement in Germany determined him to return to his own country. He settled in Düsseldorf, and by his popular lyrics greatly increased the enthusiasm of the democratic party. His poem *Die Todten an die Lebenden* ("The Dead to the Living") subjected him to indictment and prosecution by the government. He was defended by celebrated lawyers, and his trial produced an intense excitement. On his acquittal (Oct. 3, 1848) the poem was in immediate demand, numerous editions were issued, and it was circulated all over Germany. This is said to have been the first instance in Prussia of a jury trial for a political crime. Being still exposed to persecution by the government, Freiligrath returned to London in 1851, and was subjected to many trials until he became connected with the London branch of the bank of Switzerland; but the suspension of this institution in 1866 placed him again in difficulties, from which he was relieved by a national subscription taken up by his friends and admirers in Germany, which placed him in possession of a handsome income. From 1868 he resided in Canstatt. During the Franco-German war he wrote numerous patriotic songs which became popular. His principal works are: *Gedichte* (Stuttgart, 1838; 81st ed., 1874), *Die Revolution* (Leipzig, 1848), and *Neuere politische und sociale Gedichte* (Cologne, 1849). A complete edition of his works in 6 volumes appeared in New York in 1858-'9, and in Stuttgart in 1870. Freiligrath was also an extensive compiler and translator. Among his most important translations are portions of Shakespeare, Mrs. Hemans, and Tennyson, the whole of Burns, and Longfellow's "Hiawatha." A selection, by his daughter, from the English translations of his poems was published in the Tauchnitz "Collection of German Authors" (Leipzig, 1869).

FREISING, Freysing, or Freisingen, a town of Bavaria, in the district of Upper Bavaria, on the Isar, 20 m. N. E. of Munich; pop. in 1871, 7,778. It has a theological faculty, a gymnasium, a normal school, and five churches. Near it is the former abbey of Weißenstephan, now a royal castle, and (since 1852) a normal agricultural establishment with a celebrated agricultural school. In 724 a bishopric was established at Freising, which on the reorganization

of the Catholic church in Bavaria in 1802 was united with the new archbishopric of Munich, whose occupant bears the title of archbishop of Munich and Freising.

FRÉJUS (anc. *Forum Julii*), a maritime town of S. France, in the department of Var, on an eminence overlooking the sea at the mouth of the Argens, 45 m. N. E. of Toulon; pop. in 1866, 2,887; with the suburb of St. Raphael, 3,050. It is the seat of a bishop and a commercial court, and has an episcopal seminary, a library, and a hospital. Its manufactures are corks, soap, oil, and wine. The town was founded by a colony from Massilia, and is supposed to have derived its name from Julius Cæsar. Augustus made it a naval station, and kept there the ships taken at the battle of Actium. The ancient harbor is now entirely filled up by the deposits of the river, and the moles at its entrance are 3,000 ft. from the sea. Among the Roman remains are an aqueduct that can be traced more than 24 m. up the valley of the Siagnolle, an amphitheatre 650 ft. in circumference, a triumphal arch, and the pharos. Fréjus was the birthplace of Julius Agricola and of the abbé Sieyès.

FRELINGHUYSEN. **I. Frederick**, an American statesman, born in New Jersey, April 13, 1758, died April 13, 1804. He graduated at Princeton college in 1770, and in 1775 was sent as a delegate from New Jersey to the continental congress. He served with distinction as captain of a volunteer corps of artillery at the battles of Trenton and Monmouth, and in the former, it is said, shot Col. Rahl, the commander of the Hessians. He was promoted to be colonel, and served during the remainder of the war. After the peace he filled various state and county offices, and in 1790, when the New Jersey and Pennsylvania troops were called to take part in the expedition against the western Indians, he was appointed major general by President Washington. In 1793 he was elected a senator of the United States, which post he occupied for three years, when, in consequence of domestic bereavement, he resigned, and devoted the remainder of his life to his family and private affairs. **II. Theodore**, an American statesman, son of the preceding, born at Millstone, Somerset co., N. J., March 28, 1787, died in New Brunswick, N. J., April 12, 1862. He graduated at Princeton college in 1804, and in 1808 was admitted to the bar, where he soon became distinguished as an eloquent advocate. During the war with Great Britain in 1812-'15, he raised and commanded a company of volunteers. In 1817 he was elected attorney general of New Jersey by a legislature opposed to him in politics, and held the post till 1829, when he was chosen United States senator. In the senate Mr. Frelinghuysen acted with the whig party. He exerted himself in behalf of the Indians, advocated the bill to suppress the carrying of mails on the sabbath, supported Mr. Clay's resolution for a national fast in the season of the cholera, spoke in favor

of the extension of the pension system, and acted in unison with Mr. Clay on the questions of the tariff and the compromise act of 1833. In 1838 he was chosen chancellor of the university of New York, and took up his residence in that city. In May, 1844, the whig national convention at Baltimore nominated him for vice president and Henry Clay for president. They received 105 electoral votes, while James K. Polk and George M. Dallas received 170 votes. In 1850 Mr. Frelinghuysen resigned the chancellorship of the university of New York to become president of Rutgers college, New Brunswick, N. J., and removed to that city, where he resided until his death.—See "Memoir of the Life of T. Frelinghuysen," by T. W. Chambers. **III. Frederick Theodore**, an American statesman, nephew and adopted son of the preceding, born at Milltown, Somerset co., N. J., Aug. 4, 1817. He graduated at Rutgers college in 1836, was admitted to the bar in 1839, was appointed attorney general of the state in 1861, and reappointed in 1866. He was appointed United States senator in 1866 to fill a vacancy, and was elected in 1867 for the rest of the term, which expired in 1869. In the following year he was chosen senator for the term beginning in 1871.

FRÉMIET, Emmanuel, a French sculptor, born in Paris about 1824. He acquired the rudiments of his art in the studio of his uncle, the late François Rude, and was employed in anatomical labors at the clinic of the medical school. In 1848 he exhibited the picture of a gazelle, and in 1850 one of a wounded dog, which made him famous as a rival of Barye. The ministry of state purchased in 1853 his "Horse at Montfaucon," and subsequently his "Gallic Cavalier." He has executed many other works, including equestrian statues of Napoleon I. and III., and numerous statuettes. Among his later productions is the "Transformation of Neptune into a Horse" (1868).

FREMONT. I. A S. W. county of Iowa, bordering on Missouri, and bounded W. by the Missouri river, which separates it from Nebraska; area about 500 sq. m.; pop. in 1870, 11,174. It has a rich soil and a diversified surface, with extensive prairies and timber land, watered by Nishnabotona river. The St. Joseph and Council Bluffs railroad passes through the county. The chief productions in 1870 were 81,521 bushels of wheat, 1,650,863 of Indian corn, 58,122 of oats, 66,206 of potatoes, and 147,811 lbs. of butter. There were 4,411 horses, 12,209 cattle, 5,174 sheep, and 26,799 swine; 4 manufactories of carriages and wagons, 4 of brooms and wisp brushes, 9 of bricks, 6 of saddlery and harness, 4 of tin, copper, and sheet-iron ware, 1 pork-packing establishment, 6 flour mills, and 10 saw mills. Capital, Sidney. **II.** A S. central county of Colorado, intersected by the Arkansas river, and bounded S. W. by the Rocky mountains, which also occupy the N. portion; area about 2,200 sq. m.; pop. in 1870, 1,064. The surface is generally

broken; the valleys are fertile and well watered. Bituminous coal, gypsum, marble, alum, and petroleum are found. The chief productions in 1870 were 5,511 bushels of wheat, 16,585 of Indian corn, and 8,096 of oats. The value of live stock was \$71,104. Capital, Cañon City.

FREMONT, a city and the capital of Sandusky co., Ohio, on the W. bank of Sandusky river, which is crossed by a bridge, at the head of navigation, and at the intersection of the Lake Shore and the Lake Erie and Louisville railroads, 100 m. N. of Columbus; pop. in 1870, 5,455. The city has considerable trade, lines of steamers running to the principal ports of Lake Erie, and contains a national bank, three weekly newspapers, 17 public schools, including a high school, and manufactories of woollens, sashes and blinds, flour, and iron. It was formerly called Lower Sandusky.

FREMONT, John Charles, an American explorer and soldier, born in Savannah, Ga., Jan. 21, 1813. His father was a Frenchman who had settled in Norfolk, Va., where he supported himself by teaching his native language. He died in 1818. His widow, a Virginian, whose maiden name was Whiting, with three infant children settled in Charleston, S. C. At the age of 15 John Charles entered the junior class of Charleston college. For some time he stood high, and made remarkable attainments in mathematics; but his inattention and frequent absences at length caused his expulsion. After this he obtained employment as a private teacher of mathematics, and took charge at the same time of an evening school. In 1833 he became teacher of mathematics on board of the sloop of war Natchez, then in the port of Charleston, from which she sailed on a cruise to the coast of South America. Fremont was absent in her for more than two years, and on his return passed a rigorous examination at Baltimore for the post of professor of mathematics in the navy, and was appointed to the frigate Independence; but he soon resolved to quit the sea, and engaged as a surveyor and engineer on a railroad line between Charleston and Augusta, Ga. Subsequently he assisted in the survey of the railroad line from Charleston to Cincinnati, and particularly in the exploration of the mountain passes between North Carolina and Tennessee. This work being suspended in the autumn of 1837, he accompanied Capt. Williams of the army in a military reconnaissance of the mountainous Cherokee country in Georgia, North Carolina, and Tennessee. In anticipation of hostilities with the Indians, this survey was rapidly made in the depth of winter, and was Fremont's first experience of a campaign amid mountain snows. In 1838-'9 he accompanied M. Nicolle in explorations of the country between the Missouri and the British line. While thus engaged in 1838, he received from President Van Buren, under date of July 7, a commission as second lieutenant in the corps of topographical engineers. While at Washington in 1840, employed in the prep-

aration of the report of these expeditions, he became acquainted with Miss Jessie Benton, a daughter of Col. Thomas H. Benton, at that time a senator from Missouri. An engagement was formed, but as the lady was only 15 years of age, her parents objected to the match, and suddenly, probably through the potent influence of Col. Benton, the young officer received from the war department a peremptory order to make an examination of the river Des Moines on the western frontier. The survey was rapidly executed, and shortly after his return from this duty the lovers were secretly married, Oct. 19, 1841. In the following year Fremont projected a geographical survey of the entire territory of the United States from the Missouri river to the Pacific ocean. He applied to the war department for employment on this service, and received instructions to explore the Rocky mountains, and particularly to examine the South pass. He left Washington May 2, 1842, and accomplished his task successfully in the course of four months, having carefully examined the South pass, and explored the Wind River mountains, ascending their highest point, since known as Fremont's peak (13,570 ft.). His report of the expedition was laid before congress in the winter of 1842-'3, and attracted great attention both at home and abroad. Immediately after its publication Fremont planned a second expedition, much more comprehensive than the first. He determined to extend his explorations across the continent, and to survey the then unknown region lying between the Rocky mountains and the Pacific ocean. In May, 1843, he commenced his journey with 39 men, and on Sept. 6, after traveling more than 1,700 miles, came in sight of the Great Salt lake, of which no accurate account had ever been given, and of which very vague and erroneous notions were entertained. His investigations effected important rectifications in our geographical knowledge of this portion of the continent, and had subsequently a powerful influence in promoting the settlement of Utah and of the Pacific states. From the Great Salt lake he proceeded to the upper tributaries of the Columbia, whose valley he descended till he reached Fort Vancouver, near the mouth of that river. On Nov. 10 he set out on his return to the states. He selected a S. E. route, leading from the lower part of the Columbia to the upper Colorado, through an almost unknown region, crossed by high and rugged mountain chains. He soon encountered deep snows, which forced him to descend into the great basin, and presently found himself in the depth of winter in a desert, with the prospect of death to his whole party from cold and hunger. By astronomical observation he found that he was in the latitude of the bay of San Francisco, but between him and the valleys of California was a range of mountains covered with snows which the Indians declared no man could cross, and over which no reward could induce them to attempt to guide him. Fremont

undertook the passage without a guide, and accomplished it in 40 days, reaching Sutter's Fort on the Sacramento early in March, with his men reduced almost to skeletons, and with only 33 out of 67 horses and mules remaining. He resumed his journey March 24, and proceeding southward, skirted the western base of the Sierra Nevada, crossed that range through a gap, entered the great basin, and again visited the Salt lake, from which through the South pass he returned to Kansas in July, 1844, after an absence of 14 months. The reports of this expedition occupied in their preparation the remainder of 1844. Fremont was brevetted captain in January, 1845, and in the spring of that year he set out on a third expedition to explore the great basin and the maritime region of Oregon and California. The summer was spent in examining the head waters of the rivers whose source is in the dividing ridge between the Pacific and the Mississippi valley, and in October he encamped on the shores of the Great Salt lake. Thence he proceeded to explore the Sierra Nevada, which he crossed again in the dead of winter with a few men to obtain supplies from California for his party, with whom he made his way into the valley of the San Joaquin, where he left his men to recruit, and went himself to Monterey, which was at that time the capital of California, to obtain from the Mexican authorities permission to proceed with his exploration. This was granted, but was almost immediately revoked, and Fremont was peremptorily ordered to leave the country without delay. He as peremptorily refused to comply. The Mexican governor, Gen. Castro, mustered the forces of the province and prepared to attack the Americans, who were only 62 in number. Fremont took up a strong position on the Hawk's peak, a mountain 30 m. from Monterey, built a rude fort of felled trees, hoisted the American flag, and, having plenty of ammunition, resolved to defend himself. The Mexican general formed a camp with a large force in the plain immediately below the position held by the Americans, whom he hourly threatened to attack. On the evening of the fourth day of the siege Fremont withdrew with his party and proceeded toward the San Joaquin. The fires were still burning in his deserted camp when a messenger arrived from Gen. Castro to propose a cessation of hostilities. Without further molestation Fremont pursued his way northward through the valley of the Sacramento into Oregon. Near Tlamath lake, on May 9, 1846, he met a party in search of him with despatches from Washington, directing him to watch over the interests of the United States in California, there being reason to apprehend that the province would be transferred to Great Britain, and also that Gen. Castro intended to destroy the American settlements on the Sacramento. Fremont promptly retraced his steps to California. Gen. Castro was already marching against the settlements. The settlers rose

in arms, flocked to Fremont's camp, and under his leadership the result was that in less than a month all northern California was freed from Mexican authority. On July 4 Fremont was elected governor of California by the American settlers. On the 10th of that month he learned that Commodore Sloat, who commanded the United States squadron on the coast, had taken possession of Monterey. Fremont proceeded to join the naval forces, and reached Monterey with 160 mounted riflemen on the 19th. Commodore Stockton about the same time arrived at Monterey with the frigate Congress, and took command of the squadron, with authority from Washington to conquer California. At his request Fremont, who had been promoted (May 27) to the rank of lieutenant colonel, organized a force of mounted men, known as the "California battalion," of which he was appointed major. He was also appointed by Com. Stockton military commandant and civil governor of the territory, the project of making California independent having been relinquished on receipt of intelligence that war had broken out between the United States and Mexico. On Jan. 13, 1847, he concluded with the Mexicans articles of capitulation which terminated the war in California, and left that country permanently in the possession of the United States. Meantime Gen. Kearny, with a small force of dragoons, had arrived in California. A quarrel soon broke out between him and Com. Stockton as to who should command. They each had instructions from Washington to conquer and organize a government in the country. Fremont had accepted a commission from Com. Stockton as commander of the battalion of volunteers, and had been appointed governor of the territory. Gen. Kearny, as Fremont's superior officer in the regular army, required him to obey his orders, which conflicted with those of Com. Stockton, whose authority Fremont had already fully recognized as commander-in-chief of the territory; an authority which had also been admitted by Gen. Kearny for a considerable period after his arrival. In this dilemma Fremont concluded to obey the orders of Com. Stockton. Despatches from Washington received in the spring of 1847 terminated this conflict of authorities by directing Com. Stockton to relinquish to Gen. Kearny the supreme command in California. Fremont hesitated no longer to place himself under Gen. Kearny's orders, who in June set out overland for the United States, ordering Fremont to accompany him, and treating him with deliberate disrespect throughout the journey, until at Fort Leavenworth, Aug. 22, he put him under arrest, and directed him to go to Washington and report himself to the adjutant general. He arrived at Washington Sept. 16, and immediately asked for a speedy trial on Gen. Kearny's charges. Accordingly a court martial was held, beginning Nov. 2, 1847, and ending Jan. 31, 1848, which

found him guilty of "mutiny," "disobedience of the lawful command of a superior officer," and "conduct to the prejudice of good order and military discipline," and sentenced him to be dismissed from the service. A majority of the members of the court recommended him to the clemency of President Polk. The president refused to confirm the verdict of mutiny, but approved the rest of the verdict and the sentence, of which, however, he immediately remitted the penalty. Fremont declined to avail himself of the president's pardon, and forthwith resigned his commission as lieutenant colonel. On Oct. 14, 1848, Fremont started on a fourth expedition across the continent, at his own expense. With 33 men and 120 mules he made his way along the upper waters of the Rio Grande through the country of the Utes, Apaches, Comanches, and other Indian tribes, then at war with the United States. His object was to find a practicable passage by this route to California. In attempting to cross the great Sierra, covered with snow, his guide lost his way, and Fremont's party encountered horrible suffering from cold and hunger, a portion of them being driven to cannibalism. All of his animals and one third of his men perished, and he was forced to retrace his steps to Santa Fé. Undaunted by this disaster, he gathered another band of 80 men, and after a long search discovered a secure route, which conducted him eventually to the Sacramento in the spring of 1849. He now determined to settle in California, where in 1847 he had bought the Mariposa estate, a very large tract of land, containing rich gold mines. His title to this estate was contested, but after a long litigation it was decided in his favor in 1855 by the supreme court of the United States. In 1849 he received from President Taylor the appointment of commissioner to run the boundary line between the United States and Mexico. The legislature of California, which met in December, 1849, elected him on the first ballot one of the two senators to represent the new state in the senate of the United States. He consequently resigned his commissionership, and departed for Washington by way of the isthmus. He took his seat in the senate Sept. 10, 1850, the day after the admission of California as a state. In drawing lots for the terms of the respective senators, Fremont drew the short term, ending March 4, 1851. The senate remained in session but three weeks after the admission of California, and during that period Fremont devoted himself almost exclusively to measures relating to the interests of the state he represented. For this purpose he introduced and advocated a comprehensive series of bills, 18 or 20 in number, embracing almost every object of legislation demanded by the peculiar circumstances of California. In the state election of 1851 in California, the party which had opposed the introduction of slavery, and had placed the proviso against it in the

state constitution, was defeated. As Fremont was one of the leaders of this party, he failed of reelection to the senate, after 142 ballotings. The next two years he devoted to his private affairs, and visited Europe in 1852, where he spent a year, and was received with distinction by many eminent men of letters and of science. While in Europe he learned that congress had made an appropriation for the survey of three routes from the Mississippi valley to the Pacific. He immediately returned to the United States for the purpose of fitting out a fifth expedition on his own account to complete the survey of the route he had taken on his fourth expedition. He left Paris in June, 1853, and in September was on his march across the continent. He found passes through the mountains on the line of lat. 38° and 39°, and reached California in safety, after enduring great hardships. For 50 days his party lived on horse flesh, and for 48 hours at a time were without food of any kind. In the spring of 1855 Fremont with his family took up his residence in New York, for the purpose of preparing for publication the narrative of his last expedition. His name now began to be mentioned in connection with the presidency by those who were combining to act against the democratic party on the basis of opposition to the extension of slavery. The republican national convention, which met at Philadelphia, June 17, 1856, nominated him for the presidency by a vote of 359 to 196 for John McLean, on an informal ballot. On the first formal ballot Fremont was unanimously nominated. He accepted the nomination in a letter dated July 8, 1856, in which he expressed himself strongly against the extension of slavery and in favor of free labor. A few days after the Philadelphia convention adjourned, a national American convention at New York also nominated him for the presidency. He accepted their support in a letter dated June 30, in which he referred them for an exposition of his views to his forthcoming letter accepting the republican nomination. After a most spirited and exciting contest, the presidential election resulted in the choice of Mr. Buchanan by 174 electoral votes from 19 states, while Fremont received 114 votes from 11 states, including the six New England states, New York, Ohio, Michigan, Iowa, and Wisconsin. Maryland gave her eight electoral votes for Mr. Fillmore. The popular vote for Fremont was 1,841,000; for Buchanan, 1,838,000; for Fillmore, 874,000. In 1858 Fremont went to California, where he resided for some time. In 1860 he visited Europe. Soon after the breaking out of the civil war he was made a major general and assigned to the command of the western district. On Aug. 31, 1861, he issued an order emancipating the slaves of those in his district who were in arms against the United States, which was annulled by the president as unauthorized and premature, and he was

relieved from his command, Nov. 2. Three months later he was appointed commander of the mountain district of Virginia, Kentucky, and Tennessee. He fought on June 8, 1862, an indecisive battle against Gen. Jackson at Cross Keys; and shortly afterward, on Pope being appointed to the command of the army of Virginia, Fremont declined to serve under an officer whom he ranked, and sent in his resignation, which was accepted by the president. He took no further part in the war. On May 31, 1864, a convention of republicans dissatisfied with Mr. Lincoln met at Cleveland and nominated Gen. Fremont for president. He accepted the nomination, but in September, finding that he had few followers, withdrew from the field. He has since taken no part in public affairs, but has been active in promoting a projected southern transcontinental railway. In connection with this he was accused of fraud in France, and in 1873 was found guilty in a trial in Paris, and in his absence was sentenced to fine and imprisonment. He resides in New York in winter and at Mount Desert, Me., in summer.

FREMY, Edmond, a French chemist, born at Versailles in 1814. His father, a professor of chemistry, instructed him in that science, and he perfected his knowledge as assistant of T. J. Pelouze and of Gay-Lussac in various institutions; and he succeeded the former in 1843 in the chair of the museum of natural history, and the latter in 1850 at the polytechnic school, and became a member of the academy of sciences in 1857. He has made chemical discoveries and published many works. His joint productions with Pelouze include *Abrégé de chimie* (1848; 6th ed., 1869), and *Cours de chimie générale* (1849), which subsequently appeared under the title of *Traité de chimie générale, analytique, industrielle et agricole* (3d revised and illustrated edition, 7 vols., 1862-'5).—His brother ARNOULD (born in 1809) is a well known journalist and prolific novelist.

FRENCH, a N. E. county of Dakota territory, recently formed and not included in the census of 1870; area about 1,450 sq. m. It is drained by the Sheyenne river, and contains a portion of Minnewakan or Devil's lake.

FRENCH BROAD RIVER, a river of North Carolina and Tennessee, rising in Transylvania co. of the former state, near the foot of the Blue Ridge, flowing N. W. into Tennessee, bending toward the S. W., and discharging into Holston river 4 m. above Knoxville. It is about 200 m. long, and is navigable by steamboats as far as Dandridge, Jefferson co., Tenn. For about 40 m. from Asheville to the Tennessee line, it is remarkable for its beautiful scenery, flowing through deep mountain gorges, or overhung by cliffs. Nearly opposite the Warm Springs, in Madison co., N. C., are precipices known as the Chimneys and the Painted Rocks. The latter, which are between 200 and 800 ft. high, derive their name from some Indian pictures still to be seen on them.

FRENCH HORN. See HORN.

FRENEAU, Philip, an American poet, born in New York, Jan. 13, 1752, died near Freehold, N. J., Dec. 18, 1832. He was educated at Nassau Hall, Princeton, N. J., where James Madison was his room mate, and where he wrote his "Poetical History of the Prophet Jonah." He intended to study law, but finally followed a seafaring life. During the revolution his political burlesques in verse and prose were very popular with the patriots. While on a voyage to the West Indies in 1780 he was captured by the British and confined for a long time in the Scorpion prison ship at New York, which he commemorated in his poem "The British Prison Ship." When Jefferson was secretary of state Freneau became French translator under him, and at the same time editor of the "National Gazette," a paper hostile to Washington's administration. It was discontinued in October, 1793, and in 1795 he began a newspaper near Middletown Point, N. J., which he continued for a year, and published there an edition of his poems. He next edited for a year in New York "The Time Piece," a tri-weekly, after which he again became master of a merchant vessel. During the second war with Great Britain he recorded in stirring verse the triumphs of the American arms. The close of his life was spent in retirement. Many of his smaller poems possess great elegance of diction, and Scott and Campbell borrowed whole lines from him. Several editions of his poems were published during his life, and E. A. Duyckinck has edited his "Poems of the Revolution" (New York, 1865).

FRÈRE. I. Charles Théodore, a French painter, born in Paris in 1815. He studied with Roqueplan, and exhibited but little talent until he visited the East. He has since won some reputation as a delineator of eastern subjects. Among his recent works are "The Island of Philœ," "The Café of Galata," "The Evening Prayer," "Arabio Wedding at Cairo," "The Caravan of Mecca," "Ruins of Palmyra," and "The Simoom." **II. Pierre Edouard**, a French painter, brother of the preceding, born in Paris, Jan. 10, 1819. He studied with Paul Delaroche, devoted himself to *genre* painting and to small pictures, and exhibited his first work in 1843. He has since acquired distinction, and many of his works have been photographed and lithographed. Some of his later pictures are: "The Workshop at Ecouen," "Palm Sunday," and "The Benedicite," exhibited in 1866; "The First Steps," "The Prayer," "The Library," "The Little Woodcutters," "The Stove," and an "Interior at Royat," in 1867; and "Boys leaving School" and "Girls leaving School," in 1869.

FRERE, John Hookham, an English poet and diplomatist, born in London, May 21, 1769, died in Malta, Jan. 7, 1846. He was educated at Eton and Cambridge, and while a school boy translated the remarkable war song upon the victory of Athelstan at Brunnenburg from the

Anglo-Saxon of the 10th century into the Anglo-Norman of the 14th. It is found in the first volume of Ellis's "Specimens of the Early English Poets." When at Eton, in connection with Canning and Robert Smith, he started and carried on to 40 numbers a weekly paper called the "Microcosm." On leaving Cambridge, in 1795, he entered the foreign office under Lord Grenville, and in the following year he was returned to parliament. He succeeded Canning as under-secretary for foreign affairs in 1799, and subsequently served in various diplomatic missions. During his leisure he made exquisite translations from the Greek and Spanish. In 1817 he published an extravaganza of the Pulci and Casti school, under the title of "Whistlercraft's Prospectus and Specimen of an Intended National Poem" (also called "The Monks and the Giants"), which treated in a light and satirical way the adventures of King Arthur. Its peculiar stanza and sarcastic pleasantry formed the immediate exemplar of Byron's "Beppo" and "Don Juan." Frere was a contributor to the "Anti-Jacobin," and was one of the founders of the London "Quarterly Review." For many years before his death he resided in Malta, receiving from the government a liberal diplomatic pension. See his "Works in Verse and Prose," with memoir by his nephews (2 vols., London, 1872).—His nephew, Sir HENRY BARTLE EDWARD, born in 1815, was governor of Bombay from 1862 to 1867, and subsequently became vice president of the royal geographical society. In 1878 he negotiated a treaty with the sultan of Zanzibar for the suppression of the slave trade.

FRÉRET, Nicolas, a French scholar, born in Paris, Feb. 15, 1688, died there, March 8, 1749. Admitted in 1714 to the academy of inscriptions and belles-lettres, of which he was afterward perpetual secretary, he was imprisoned for his first memoir, which discussed the origin of the French. On recovering his liberty in 1715, he began to produce the long series of memoirs which gave him distinction as an antiquary, philosopher, and philologist. The annals of the Assyrians, Chaldeans, Egyptians, and Hindoos, the principal ancient and oriental cosmogonies and theogonies, and numerous questions of history and geography are among the objects of his research. He wrote on chronology against Newton. An incomplete collection of his works was made by Leclerc de Septchènes (20 vols., Paris, 1796-'9). A more complete one was undertaken by Champollion-Figeac, but only the first volume was issued (Paris, 1825).

FRÉRON. I. Élie Catherine, a French journalist, born in Quimper in 1719, died in Paris, March 10, 1776. He studied under the Jesuits in the college of Louis-le-Grand at Paris, in which he was for a short time professor. At the age of 20 he joined Desfontaines in conducting his journal of criticism, and in 1746, after the death of the latter, commenced a similar periodical, entitled *Lettres à Madame la*

*Comtesse de * * ** This was suppressed in 1749, but resumed under the title *Lettres sur quelques écrits de ce temps*, in which he was associated with the abbé de La Porte. This was succeeded in 1754 by *L'Année littéraire*, which Fréron conducted alone, and which was the chief foundation of his reputation. In this he showed himself an admirer of the age of Louis XIV., and a decided adversary of the new philosophical and literary doctrines. The severity of his criticisms produced against him the most violent hatred, and the rest of his life was a warfare with the encyclopædists. Throughout the literary history of the time his name is inseparable from that of Voltaire, who was stung by the satires which appeared weekly in *L'Année littéraire*. Fréron never missed an opportunity to attack him, and Voltaire repaid him with equal malice. He stops in the midst of a grave historical discussion to insult Fréron; he assails him in his most dignified tragedies, as well as in *La pucelle* and *Candide*; he hurls against him the philippic of *Le pauvre diable*, and in the comedy of *L'Écosaisie* calls his journal *L'Âne littéraire*. Fréron sustained the conflict alone with considerable success, but was defeated at last and died in grief for the suppression of his journal. He is now remembered as a calm observer of the society of his time, and the founder of newspaper criticism in France. II. *Louis Stanislas*, a French revolutionist, son of the preceding, born in Paris in 1765, died in Hayti in 1802. A schoolfellow of Robespierre and Camille Desmoulins, he became one of the most fervent of the revolutionary party, and published a ferocious newspaper, *L'Orateur du Peuple*. He was at the same time a member of the club of Cordeliers. He participated in the insurrection of Aug. 10, and in the slaughters of September, 1792, and was elected to the convention, where he took his seat among the Montagnards; he voted for the king's death, and contributed to the fall of the Girondists. Being appointed one of the commissaries sent with the army against Marseilles and Toulon, he signalized himself by such brutalities that he was censured even by the committee of public safety. After the death of Danton he sided with the Thermidorians against Robespierre, and in conjunction with Barras commanded the troops who arrested the dictator and his adherents at the hôtel de ville. He pursued unrelentingly the members of the committee of public safety, procured the condemnation of Fouquier-Tinville, became the chief of a reactionary band of young men known as *la jeunesse dorée*, was instrumental in suppressing the Jacobins, and energetically opposed all attempts at insurrection. Under the directory he was sent to the south on a mission of peace; but his former cruelties were still remembered by the people. He accepted an appointment as subprefect in Hayti, and soon after his arrival there died of yellow fever.

FRESCO PAINTING (Ital. *fresco*, fresh), a method of ornamenting the walls and ceilings

of buildings by painting designs in colors ground in water and mixed with lime upon the freshly laid plaster. It was much practised by Italian masters during the three or four centuries immediately succeeding the revival of painting in modern times, and the walls of many Italian palaces, churches, and convents are still adorned with works executed by their hands. The outlines of the designs are first drawn upon thick paper attached to cloth, which is stretched upon a frame. These are called cartoons, from the Italian *cartone*, pasteboard. An additional colored cartoon is also prepared to serve as a study of color, and a guide during the execution of the fresco. The famous cartoons of Raphael, now deposited in the South Kensington museum, London, are of this character, although made to be copied in tapestry. The cartoons serve to give copies upon tracing paper, and these being attached to the wall in portions of convenient size, the outline is transferred to the wet plaster by going over the lines with a sharp point. Another method is to prick the figures through the cartoon, or upon a separate sheet laid behind it, and then, placing either the cartoon itself or the duplicate sheet upon the plaster, to dust through the holes a black coloring matter, which attaches itself in the lines of the figures to the walls. Several great painters have worked immediately on the plaster, without the intervention of any guide whatever. The preparation of the walls is an object of especial care. All the mortar should be fresh work, and of clean sand and good lime. When the rough coat is perfectly dry and hard, the smoother layers are added of the most carefully prepared mortar. In Munich, where fresco painting has been revived with some success during the present century, the lime is sometimes slaked several years before it is used, and is kept, after thorough stirring and reduction to an impalpable consistency, in a pit covered with clean sand a foot or more in thickness, over which earth is laid. Pure rain or distilled water should be used in mixing it, and also perfectly clean sand. The rough coat being dampened till it will absorb no more water, the finer plaster is laid on, and when this begins to set a still finer coat, called by the Italians the *intonaco*, and containing a smaller proportion of sand, is applied. Before this dries, the design must be transferred to it and the painting completed; consequently only small portions of a fresco can be executed at one time. The drying may be checked by occasional sprinkling with water, or by keeping wet sheets pressed to the design, as it is attached to the wall. The joinings or lines between the work of one day and that of the next are made to coincide with lines in the composition, or take place in shadows. As any retouching is impracticable, the painter must work rapidly before the ground becomes too dry to take the colors. If others are afterward applied mixed with size, white of egg, or

gum, which is in effect only tempera painting, they do not long continue to harmonize with the rest of the work. The colors must be of substances not liable to be affected by contact with the lime, and those of a mineral nature are almost exclusively used. Lime, or the dust of white marble, makes a good white. Chrome, the ochres, verditer, lapis lazuli, &c., furnish many of the colors. The brushes must be so soft as not to roughen the plaster surface.—In addition to the process above described, which was called by the Italians *buon fresco*, or the true fresco, the early masters had other methods of painting on lime or plaster, to which the general name of fresco is usually applied. The most important of these was that known as *fresco secco*, or dry fresco, so called because the plastering, having been allowed to dry thoroughly, was remoistened before the color was applied, whereby the artist was enabled to quit or resume his work at pleasure, and to avoid the joinings observable in the true fresco painting. This process was universal in Italy until the close of the 14th century, when *buon fresco* in a measure took its place. In this manner were probably executed the paintings in Pompeii and Herculaneum, and, indeed, all the so-called ancient frescoes. Work done in this way will bear to be washed as well as real fresco, and is as durable; but it is considered, in every important respect, an inferior art.—A new method of preparing the wall and painting in fresco has been introduced in Germany by Prof. Von Fuchs, called the stereochrome. The wall is coated with a preparation of clean quartz sand mixed with the least possible quantity of lime; and after the application of this the surface is scraped to remove the outer coating in contact with the atmosphere. It is then washed with a solution of silica, prepared with silica 23.21 parts in 100, soda 8.80, potash 2.52, water 65.87. The wall is thus said to be fixed; and if too strongly fixed, it must be rubbed with pumice. As the painter applies his colors he moistens the work by squirting distilled water upon it. When finished it is washed over with the silica solution. The picture also, as it is in progress, is washed with the same solution, and the colors thus becoming incorporated in the flinty coating, the picture is rendered hard and durable as stone itself. In this process the artist may leave the work and return to it at any time, and he is also able to retouch and alter any portion of it. The new museum at Berlin has been adorned by this process by Kaulbach. The decorations are historical pictures, 21 ft. in height by 24½ in width, and single colossal figures, friezes, arabesques, &c. They have the brilliancy and vigor of oil paintings, with no dazzling effect of light from whatever direction they may be viewed.—Old paintings in fresco have been transferred to canvas from walls crumbling by decay, and thus preserved. A linen cloth is applied to the face of the painting, covered with a kind of glue. The *intonaco*, or last coat

of plaster, is then carefully detached from the wall with a knife. The rough surface at the back having been rubbed down with pumice stone, until the plaster is reduced to the thinnest state consistent with the preservation of the painting, canvas is fastened upon the back, and the cloth in front moistened and removed. The detached fresco may then almost be treated like a common oil picture. It is quite common in Italy to remove by this method frescoes of value, for sale, or for preservation in public museums. Such was the process successfully employed in removing and preserving the paintings on the old walls of the convent of Sta. Eufemia at Brescia in 1829.—The history of fresco painting during the first two centuries after the revival of art is a history of painting, as nearly every considerable work was executed by that process. As a means of conveying thoughts, ideas, and information, not then, as now, acquired through literature, it continued to subserve a useful purpose even after the invention of printing. Hence the early masters, laboring for the edification of men in general, and not for the gratification of individuals—or, to adopt the language of the ancient fraternity of the painters of Siena, “being teachers to ignorant men, who know not how to read, of the miracles performed by virtue and in virtue of the holy faith”—rarely painted easel pictures, but lavished all their genius and thought upon mural decoration or fresco painting. As late as the latter half of the 16th century Vasari declares it to be “more masterly, noble, manly, secure, resolute, and durable than any other kind of painting;” and he records the opinion of Michel Angelo that fresco was fit for men, oil painting only for women, and the luxurious and idle. The abbey church of St. Francis in Assisi, near Perugia, witnessed the earliest development of fresco painting in modern times. About the middle of the 13th century Giunta of Pisa commenced a series of paintings on its walls, and during the next century and a half Cimabue, Giotto, Giotto, the Gaddi, Simone di Martino, and other painters of note were invited to add to its adornment. Neglect and exposure have injured these works, but as the earliest specimens of modern Christian art they are of surpassing value and interest. Next in date, and of even greater importance, are the decorations of the Campo Santo in Pisa, a burial ground begun toward the close of the 13th century, the walls of which employed some of the chief masters of fresco in the 14th and 15th. The early paintings, erroneously attributed to Buffalmacco and Giotto, have nearly disappeared, and time, neglect, and damp have seriously impaired the effect of the others; and such is the character of the walls on which the plaster is laid that it is considered hopeless to attempt to restore them, or to arrest the progress of decay. A series painted by Orcagna, or according to the most recent authorities by the Sienese brothers the Lorenzetti, about

1385, representing the last judgment, hell, and the triumph of death, are considered among the grandest specimens of early art. To these succeeded Simone di Martino, Taddeo Gaddi, Francesco da Volterra, Antonio Veneziano, Pietro d'Orvieto, and others, whose labors extended to the close of the century. Pietro d'Orvieto's designs, representing subjects from Genesis, were probably the earliest works in *buon fresco*, the joinings of the plaster being so frequent, as compared with earlier wall paintings, that the amount of work in each portion must have been finished at once. The wars and internal dissensions which distracted Pisa interrupted the decoration of the Campo Santo for many years; but tranquillity having been restored, Benozzo Gozzoli was invited in 1468 to complete the work. The whole of the north wall, upward of 400 ft. long, was assigned to him, and in the next 16 years he covered this immense space with a series of frescoes representing the principal events in the Old Testament, described by Vasari as *un' opera terribilissima*. Besides the works enumerated as belonging to the 14th century, we may mention Giotto's celebrated series in the Arena chapel at Padua, representing scenes from the life of the Virgin, and the same master's recently discovered portraits of Dante and other Florentine citizens in the chapel of the Bargello at Florence; the series by Taddeo Gaddi and Simone di Martino in the Spanish chapel in the church of Sta. Maria Novella, Florence, representing the "Triumph of the Church;" Spinello's "Overthrow of the Rebel Angels" in the convent of S. Agnolo, at Arezzo; and the series representing the "Fruits of Good Government and the Triumph of Peace," painted by Ambrosio Lorenzetti in the Palazzo Pubblico of Siena. In the 15th century, to the latter half of which belongs the so-called *renaissance* or new birth, when the study of the remains of ancient sculpture infused a new life into art, increased wealth and intelligence caused an increased demand for easel pictures, the value of which was greatly enhanced by the introduction of oil as a medium for mixing colors; but fresco painting still maintained its supremacy, and claimed for its function the religious and moral teaching of the people, by the representation of sacred history. The noblest achievements in art are therefore still those of the fresco painters. The great names of the century are Pietro della Francesca, whose frescoes in the church of S. Francesco in Arezzo, Vasari says, "might be called too beautiful and excellent for the time in which they were painted;" Masolino; Filippo Lippi, who painted the frescoes in the duomo at Prato; Fra Angelico da Fiesole; Masaccio, whose series of the life of St. Peter in the Brancacci chapel in the church of Sta. Maria del Carmine, in Florence, to which additions were afterward made by Filippino Lippi, formed an epoch in art; and Ghirlandaio, the master of Michel Angelo, whose frescoes representing the his-

tories of John the Baptist and the Virgin afforded models for Leonardo da Vinci, Raphael, and Michel Angelo. Luca Signorelli, Andrea Mantegna, the great founder of the Mantuan school, Francesco Francia, who decorated the church of St. Cecilia in Bologna, Perugino, the master of Raphael, Fra Bartolommeo, and some others, belong partly to this century and partly to the next, which witnessed at once the culmination of the art of fresco painting, and its corruption and decline. The three most illustrious painters of this latter era, Leonardo da Vinci, Raphael, and Michel Angelo, embodied their loftiest conceptions on the walls and ceilings of churches and palaces, and their numerous disciples filled Italy with imitations, degenerating toward the close of the century into lifeless mannerisms. Leonardo's chief work is the well known "Last Supper," executed for the refectory of the convent of Sta. Maria delle Grazie at Milan, of which only the mouldering remains are now visible. It has been called the most perfect work executed since the revival of painting. Of Michel Angelo's frescoes, the most famous are the series on the ceiling of the Sistine chapel, representing the "Creation" and the "Fall of Man," with the noble figures of the prophets and sibyls; and the "Last Judgment," on the end wall of the chapel—the whole combining to a degree never since equalled grandeur of form and sublimity of expression. Raphael's frescoes exhibit perhaps, in the aggregate, the highest development of Christian art. The most famous are those covering the walls and ceilings of the chambers in the Vatican, known as the "Stanze of Raphael," although many of these works, as well as the decorations of the *loggie* or open colonnades of the Vatican, were painted by Giulio Romano and other scholars of Raphael from his designs. Raphael's hand is seen chiefly in the series of "Theology" or the "Dispute of the Sacrament," "Philosophy" or the "School of Athens," "Poetry" or "Parnassus," and "Jurisprudence," in the Camera della Segnatura; and in the "Expulsion of Heliodorus from the Temple," the "Mass at Bolsena," "Attila," and the "Delivery of St. Peter," in the stanza of Heliodorus. He also painted the four celebrated sibyls in the Chigi chapel in the church of Sta. Maria della Pace, and the "Galatea" in the villa Farnesina in Rome. The frescoes in the Vatican, having suffered by neglect, were skilfully restored by Carlo Maratti at the beginning of the 18th century. Giulio Romano also designed and partly executed the well known "Fall of the Giants" in the palazzo del Te at Mantua. Shortly after the completion of the works in the Vatican, Correggio painted in the church of S. Giovanni in Parma his fresco of the "Ascension," and that of the "Assumption" in the duomo of the same city, in both of which the art of chiaroscuro and relief is carried to perfection. Parmigiano, his pupil, left unfinished some frescoes in the Steccata at Parma, in which a figure of Moses

breaking the tablets has been greatly extolled. The Zuccheri, Andrea del Sarto, Sebastian del Piombo, Vasari, and nearly every other distinguished painter of the age, practised fresco painting, and sometimes on the most extensive scale; but the art rapidly deteriorated until toward the close of the century, when the Carracci, Domenichino, Guido, and other painters of the eclectic school, restored somewhat of its former vitality. Their efforts, however, were but transient, and after the middle of the 17th century, with a few exceptions, no work in fresco of more than moderate merit was executed in Italy. No mention has been made of the great Venetian painters, because they seldom attempted fresco, except on the façades and exteriors of buildings, but developed their genius in oil painting.—The present century has witnessed a revival of fresco painting in various countries of Europe, more particularly in Germany, where, with the exception of a few rude mural decorations in some of the older cathedrals, the art seems never previously to have been practised. The movement was due to the enthusiasm of a number of young German artists established in Rome at the commencement of the century, whose first works were executed in the house of the consul general of Prussia, M. Bartholdy, and in the villa Massimi. In these efforts Cornelius, Overbeck, Schnorr, Schadow, Veit, Koch, and others participated, and Overbeck subsequently painted the "Vision of St. Francis" in the church of the Angeli at Assisi, in the neighborhood of the place where more than five centuries before Cimabue and Giotto had executed their first frescoes. Overbeck and a portion of the new school attempted to re-establish the sentimental or ascetic art of the early Italian masters, while others sought to create at once what they considered a national Teutonic school of painting. They were hailed throughout Germany as the regenerators of art, and King Louis of Bavaria invited Cornelius to Munich to decorate the Glyptothek and Pinakothek, as the galleries of sculpture and paintings in that city are called. Under the influence of this master a school of fresco painting sprang up in Munich, numbering among its pupils Kaulbach, Zimmermann, Hess, and many others, whose works cover the walls of the basilica of St. Boniface, the Königsbau, the Festbau, the Allerheiligen-Kapelle, and other buildings. In the Ludwigskirche is executed Cornelius's largest fresco, the "Last Judgment." In the new museum, the royal palace, and elsewhere in Berlin, are also grand specimens by Cornelius, Kaulbach, Schnorr, and others.—Mural decorations made little progress in France until the present century; but during the second empire many churches in Paris were embellished by Amaury-Duval, Motez, Brémond, and others. The most celebrated mural painting in Paris, Delaroche's "Hemicycle" in the *palais des beaux arts*, is painted in oil, although it is commonly called a fresco, and

has all the breadth and freedom of that method.—The erection of the new houses of parliament gave the first decided impulse to fresco painting in England, and in response to an invitation from a select committee of the British parliament the principal artists sent to exhibitions held in Westminster hall in 1848-'5 cartoons and specimens of fresco for the decoration of the building. Some of these designs, comprising abstract representations of religion, justice, &c., and passages from British history and mythology, were subsequently executed by Cope, Dyce, Ward, Macilise, Herbert, Watts, and others. A summer pavilion in the gardens of Buckingham palace, the hall of Lincoln's Inn, and several churches in London have also been painted with frescoes.—With respect to all frescoes, painted according to the method of the best Italian masters, it may generally be observed that in the climate of northern Europe they are soon affected by cold and dampness. Those in Munich executed on the exteriors of buildings are rapidly falling to pieces, and a similar fate has overtaken many in the British houses of parliament. The latter may in fact be considered a failure, both on account of the dampness and imperfect light of the building, and of the apparent inability of English artists to master the technical processes of fresco painting. In the opinion of eminent native artists the process is unsuited to the genius of the English school, and no completed works in fresco exist in England equal to those by the same painters executed in oil. The paintings executed according to the new stereochrome process, above described, are apparently more durable than the *buon fresco*, but it is impossible to conjecture how long they may remain in good condition.—Fresco painting has made little progress in America. The only examples of the process worthy of mention are to be found in the national capital at Washington, and they are of little artistic value.

FRESSENIUS, Karl Remigius, a German chemist, born in Frankfort, Dec. 28, 1818. He completed his studies at Bonn and at Giessen under Liebig, whose assistant he became. In 1845 he was appointed professor of chemistry, physical science, and technology at the agricultural institute in Wiesbaden, where he founded a chemical laboratory, which has acquired great celebrity, and to which a pharmaceutical school was added in 1862. In the same year he founded at Brunswick *Die Zeitschrift für analytische Chemie*. He is a high authority on analytical chemistry, and has published a valuable series of works relating to the mineral springs of Wiesbaden, and of other German watering places. His principal works are *Anleitung zur qualitativen chemischen Analyse* (Bonn, 1841; 13th ed., 1870), and *Anleitung zur quantitativen chemischen Analyse* (Brunswick, 1846; 2d ed., 1866; English translation, "System of Instruction in Quantitative Chemical Analysis," edited by S. W. Johnson, New York, 1869).

FRESNEL, Augustin Jean, a French physicist, born at Broglie, in Normandy, May 10, 1788, died at Ville d'Avray, near Paris, July 14, 1827. At a very early age he exhibited a taste for mechanical and physical science. In his 17th year he entered the polytechnic school, where he gained the applause of Legendre by a peculiar solution of a question in geometry. He passed thence to the school of bridges and roads. After graduating, he superintended the engineering operations of the government in the department of Vendée for eight years. His first memoir (1814) was a demonstration of the phenomenon of the stellar aberration. He went to Paris in 1815, in which year his first experimental researches were made, and from this time until his death his discoveries and scientific memoirs followed each other rapidly. At the commencement of 1815 he did not know what was meant by the term polarization of light, and in less than a year he stood at the head of investigators of the subject. In 1819 he gained a prize offered by the French academy of sciences for an article on diffraction. In 1823 he was elected member of the academy by a unanimous vote. In 1825 he was made an associate of the royal society of London, and in 1827 that society awarded him the Rumford medal, which was presented to him upon his deathbed by his friend and collaborator Arago. In May, 1824, he was appointed secretary of the commission of light-houses. He was at the same time engineer of the pavements of Paris and one of the examiners of the polytechnic school. From the end of 1824 until his death his health was so bad from the effects of unremitting labor that he was obliged to give up all work. The true laws of the complicated phenomena of double refraction were demonstrated by Fresnel. It is now known that nearly all crystals possess the property of double refraction. Before Fresnel's investigations it was supposed that it belonged only to Iceland spar and quartz. Fresnel in conjunction with Arago explained the interferences of polarized light, giving the phenomena and determining their laws. He proved that all the colors engendered in doubly refracting crystals are particular cases of the interference of polarized light, and also discovered the phenomena which are called circular polarization, and explained their laws. He was an able and enthusiastic advocate of the wave theory of light, against that of emission or material emanations. In 1811 a lighthouse board or commission of lighthouses was formed in France. One of the duties of this commission was to determine whether the lighting apparatus might not be improved. In 1819 Arago volunteered to take charge of the experiments on the subject, provided Fresnel and Mathieu were joined with him. The proposition was accepted, and Fresnel devoted the whole strength of his mind to the subject. The result was the system of lens-lighting apparatus which has changed the mode of lighthouse illumination throughout the

world, and is universally known as the Fresnel system. The most perfect system known before Fresnel's was that of parabolic reflectors. In this, for a fixed light, the reflectors are arranged around one or more horizontal circles with their axes parallel to the horizon, and passing (produced) through the centres of the circles. In a revolving light the reflectors are arranged with their axes parallel to each other and to the horizon. By making the system revolve, a bright flash is produced by the combined action of all the reflectors, when the eye is in or near the axis of one of them. As the rays proceeding from a lamp at the focus of a parabolic reflector are parallel to the axis after deviation by the reflector, it is evident that systems arranged as above indicated will show a bright light in the horizon to an observer situated in or near the axis of any one of the reflectors, since the reflected beam does not lose its intensity except by atmospheric absorption. Therefore the greater the number of reflectors, the better will be the light; and to produce as nearly as possible a uniform light at the horizon, the number of reflectors in important fixed lights is sometimes very great, as many as 24 having been used. In all cases the reflectors are made of copper carefully shaped to the form of a paraboloid of revolution, and covered with a uniform coating of pure silver. The objections to the reflector system are: 1, the want of uniformity of the light; 2, the great expense, each lamp requiring 50 gallons of sperm oil per annum; 3, the rapid deterioration of the reflectors from the necessity of daily cleaning the silvered surface, the silvering requiring entire renewal at least once in ten years; 4, the great loss of light caused by the reflection and by the necessary imperfections in form in a parabolic reflecting surface. As soon as he began to study the subject, Fresnel conceived the idea of substituting lenses for the reflectors. A convex lens possesses the property of making all rays proceeding from its principal focus parallel after deviation. It produces the effect by refraction that parabolic reflectors produce by reflection. If therefore a plano-convex lens could be formed which would not much exceed in thickness ordinary plate glass, the loss of light by absorption in passing through such a lens would be much less than in the case of reflection. For the two refracting surfaces the loss does not much exceed $\frac{1}{6}$, while by reflection it is about $\frac{1}{4}$. But if the exterior surface of the lens is spherical, it is evident that, supposing the lens to embrace all rays which are contained in a belt $22\frac{1}{2}^\circ$ above and $22\frac{1}{2}^\circ$ below the horizon, and in a horizontal angle of 45° , the thickness would become so great for a large principal focal distance that much of the light would be absorbed, and the lens would become useless. The weight, too, would be so great, that it would be nearly impossible to make the apparatus revolve by machinery available at the top of a lighthouse. For these reasons a lens light which existed in

England when Fresnel made his experiments was considered a failure. If now a circular central part of the curved surface of a plano-convex lens is moved parallel to itself until at its edges the glass is very thin, the diminution of thickness will not affect the parallelism of the rays after deviation, and the absorption will be very much lessened. If another part of the lens, of a convenient breadth and concentric with the first part, be moved as was the first part until its edges become very thin, the thickness of this will not much increase the absorption, and so of the whole surface of the lens; that is, it can be divided into thin concentric rings of convenient breadth and of nearly the same curvature as the lens, which will absorb but little light, and at the same time will send out the rays parallel to each other, and, if properly adjusted, parallel to the horizon. Buffon first imagined this manner of constructing a lens. Condorcet in 1778 suggested that the rings might be made in separate pieces, and Sir David Brewster made the same suggestion in 1811. Fresnel, without knowing Condorcet's or Brewster's suggestions, conceived the idea of making the lenses in steps and in separate pieces, and, following it up, had the lenses manufactured and applied to lighthouses. The vertical central section of Fresnel's lens, instead of being that of a plano-convex lens, is a figure bounded on the side toward the lamp by a vertical straight line, and on the outside by a serrated line. This last line is a portion of the arc of a circle at its central part, and receding from the centre consists of portions of arcs of circles bounded by horizontal lines. The first lens apparatus made by Fresnel consisted of eight lenses like that above described, arranged in the form of an octagonal prism. It is evident that an eye situated in the horizon would perceive a bright flash whenever one of these lenses came in front of it; and supposing the octagonal prism to be revolved about its vertical axis, there will be eight flashes in one revolution. In Fresnel's first apparatus, and in all very large ones manufactured within 10 or 12 years after his invention, the rays in the portion of the sphere above the belt deviated by the lens were brought to the horizon by a combination of lenses and plane reflectors, and those below by the combination of curved glass reflectors similar to the slats of Venetian blinds, except that the reflectors are not precisely parallel, but are placed at such angles that all the light they receive shall be thrown to the horizon. The interval between the flashes is diminished by arranging the auxiliary mirrors so that they will reflect the light a little to one side of the beam refracted by the lenses. This makes the flash longer, and correspondently diminishes the dark interval. In order to produce a fixed lens light which shall show uniformly entirely around the horizon, if the central vertical section of the lens (the section bounded by the serrated line above described) be revolved about the vertical line drawn

through the principal focus of the lens, it will generate a solid of revolution, which when made of glass will fulfil the required condition for all rays $22\frac{1}{2}^\circ$ above and $22\frac{1}{2}^\circ$ below the horizon. Those above and below this zone are brought to the horizon by a combination of lenses and reflectors on the same principle as those described for a revolving lens. But, Fresnel was not satisfied with the use of reflectors for bringing to the horizon the rays above and below the central belt of 45° . On account of the acuteness of the angles at which these rays must be incident upon any deviating surface, it was not practicable to bend them to the horizon merely by refraction at two surfaces. He therefore calculated the dimensions of a series of annular prisms, so arranged that the rays from the lamp incident upon the first surface of the prisms were refracted by it toward the horizon, were incident upon the second surface at an angle greater than that of total reflection, were reflected by it, and were so refracted by the third surface that they emerged from the prism horizontal. Thus all the rays proceeding from the lamp, except those obstructed by the glass chimney and the lamp itself, were utilized by the lens, forming the very perfection of a lighthouse apparatus. Fresnel did not live to see his idea of using the prisms instead of reflectors in the large lens apparatus carried out; but small apparatus were made on this principle for harbor lights with entire success. It is believed that the annular prisms were first used in an apparatus of the largest kind in one made at Paris under the direction of Alan Stevenson, engineer of the commission of northern lights of Scotland. The prismatic rings placed above and below the annular lens will with the lens throw all the rays to the horizon, and the combination will thus answer admirably for a fixed light. The annular prisms to fulfil their object must be arranged in conical or beehive shape above and below the annular lens. For a revolving light, a vertical central section of the annular lens with a meridian section of the system of prisms was revolved around the horizontal line joining the centre of the annular lens and the principal focus of the combination. The revolution was continued far enough to generate a larger or smaller solid as the interval between the flashes was greater or smaller, the dimensions at the top and bottom of the lens regulating the amplitude of the revolution. Thus a polygon of 8 sides answers for an interval of one minute, supposing the time of revolution to be 8 minutes, one of 16 sides to an interval of 80 seconds, and one of 24 sides to an interval of 15 seconds, supposing the time of revolution to be 6 minutes. In order to lengthen the flashes, the upper and lower systems of prisms were moved a little to one side of the central annular lenses. The flash from the prisms was therefore produced a little after that from the lens, but so soon after as to appear a part of it. Another dis-

inction was formed by revolving a system of cylindrical vertical lenses around a fixed apparatus and outside of it. These lenses collected the rays incident upon them, and emitted them parallel to each other and to the horizon. When one of the lenses came opposite the observer, the eye received a bright flash preceded and followed by a short eclipse. Before and after the eclipses the fixed light was visible. This arrangement is called a "fixed light varied by flashes." Nearly the same appearance is given by using the upper and lower prismatic rings of the fixed light and the annular lenses of the revolving light. When the latter revolves, the eye perceives a flash from the annular lens, and in the interval between the flashes perceives the light from the fixed part of the apparatus. It will be seen that the variations which this system admits for the same order far surpass in number those of reflector lights. The latter can only be either fixed or revolving, and it has been found impossible in practice to diversify the intervals between the flashes to any extent. The radii of the spherical surfaces forming the lenses, and the radii and other dimensions of the prismatic rings, are calculated by known formulas from the index of refraction, the position of the exterior surfaces of the lens with reference to the source of light, and the distances of the various concentric rings and prismatic surfaces from the horizontal plane passed through the principal focus. The surfaces of the lenses are limited in breadth by the condition that the solid of revolution shall not be thick enough to absorb a material portion of the light. This condition makes their breadth about 1.5 in. Spherical aberration is nearly eliminated by a proper use of the formulas in calculating the radii of the surfaces. The index of refraction of the glass used is 1.51. In the large lenses the rings are ground in segments of circles, are fastened into brass armatures, and are put together at the lighthouse. The small lenses are placed in their armatures, and are put together, ready for erection, at the workshops. The material used is the flint glass of St. Gobain, which, although not as colorless as crown glass, was selected because it could be obtained more free from bubbles and striae than crown glass. It is cast in pieces, exceeding the intended size of the finished parts by about one eighth. There are six orders of lenses, arranged according to size. The three first and largest are used in seacoast lights, and the three last in harbor and river lights, and generally in those of lesser importance. Fresnel's invention has also been adapted to small lanterns used for steamers' signal lights, pier-head and ferry lights, &c., and many of this kind are now manufactured in the United States of pressed glass. The first order fixed lens apparatus is about 6 ft. in diameter and 9 ft. high. The central zone consists of the central plano-convex belt and 16 steps (*échelons*), arranged in equal numbers above and below it. The low-

er set of prisms is 6 in number, and the upper set 13. This last set is arranged in the form of a cone. In the revolving first order lens, having an interval of 10 seconds, there are 17 upper and 8 lower prisms. The sixth and smallest order of lens is 11.8 in. in diameter and 17.5 in. high. The central zone is composed of the plano-convex belt and four steps, two on each side of it. There are three prisms below and five above the central zone. As the lamps in use when Fresnel made his invention were entirely incompetent to supply enough light from one burner for the use of the higher orders of lens apparatus, he in conjunction with Arago made a thorough investigation of the subject of lamps. The result was that he adopted for the first order lens a burner about 8½ in. in diameter, giving a flame about 4½ in. high, and containing four concentric wicks. The intensity of the light of this lamp is about equal to that of 25 ordinary Carcel burners which have a diameter of about three fourths of an inch. The lamp is placed in the centre of the apparatus. As the heat evolved by such a lamp is very great, there might be danger of melting the burners, and of burning up the wicks. To avoid these difficulties, Fresnel adopted the Carcel lamp, which, by a system of clockwork, pumps up to the burner four times as much oil as is consumed. By this means the burners are always kept comparatively cool, and the wicks sometimes burn a whole night without requiring snuffing. For the second order lens apparatus a lamp with three concentric wicks was adopted; for the third and fourth orders, lamps with two concentric wicks are used; and for the fifth and sixth orders, ordinary Argand burners are used. Very slight changes in any of the details of the lamps have been made since they were first settled by Fresnel. The annual consumption of oil by the lenses of the different orders is as follows: first order, 684 gallons; second, 461; third, 221; fourth, 156 to 190, according as one wick or two are used; fifth, 70; sixth, 60. In the first order octagonal revolving lens the quantity of light sent to the horizon by one of the octagonal faces and its reflectors is between 3,000 and 4,000 times the light of a single Carcel burner, being eight times as much as that sent to the horizon by the best reflectors that are made. To get the useful effect of the whole lens, the above numbers must be multiplied by 8, that being the number of annular lenses doing the work of that number of burners at the same time. The useful effect of the lens light is to that of the reflector light as 4 to 1; that is, one gallon of oil burned in a lens light throws as much light to the horizon as four gallons burned in a reflector light. The brilliancy of a first order lens light as compared with the best reflector lights is as 83 to 16, or as 5 to 1.—The first lens apparatus manufactured under the direction of Fresnel was erected in 1823 in the Cordouan lighthouse at the mouth of the Gironde, on the

coast of the bay of Biscay. The auxiliary lenses and reflectors for utilizing the rays above and below the central belt are now replaced by the prismatic rings. In 1825 the lens system was adopted for the coasts of France, and as early as 1838, 12 lighthouses on the coast were illuminated by the Fresnel system. In 1845 there were 151 lens lights on the French coast, and probably there is not a single reflector light in France at present. It was next adopted by the Dutch, and in 1834 the erection of a first order lens in Inchkeith (Scotland) lighthouse was authorized. The Trinity house corporation next adopted the Fresnel system in 1837, and it has since been used by all European maritime nations and their colonies, and by the United States. (See LIGHTHOUSE.)

FRESNILLO, a city of Mexico, in the state of Zacatecas, 305 m. N. W. of Mexico; pop. about 15,000. It is 7,284 ft. above the sea, and is partially surrounded by eminences formed by a gradual rise of the country on three sides. The streets are laid out at right angles, and well kept. The plaza, once the site of an arena for bull fights, is now a beautiful promenade. The houses are scrupulously neat; and among the public buildings the most noteworthy are the parish and three other churches, all handsomely and solidly constructed, and a school of mines, founded in 1853. Maize, wheat, and other cereals are largely cultivated; and the city markets are provided with many of the European garden vegetables and fruits, and some of the tropical fruits. The adjacent silver mines of the same name were discovered in 1569, in which year the city was founded. They were long among the most productive in the country; in 1838 the yield was \$2,310,993; in 1850 it was a quarter of a million more, and it has since increased still more.

FRESNO, a S. central county of California, between the Sierra Nevada and the Coast range; area, 8,750 sq. m.; pop. in 1870, 6,336, of whom 427 were Chinese. It is watered by the San Joaquin river and its branches. The San Joaquin valley is very fertile. The mountain forests, containing very large trees, are very extensive. The W. part of the county consists of rush-covered marshes called *tulés*. The celebrated New Idria quicksilver mines are in this county, and gold is mined to some extent. The chief productions in 1870 were 19,765 bushels of wheat, 8,980 of Indian corn, 18,875 of barley, 1,746 tons of hay, and 191,594 lbs. of wool. There were 3,074 horses, 1,009 milch cows, 14,752 other cattle, 139,677 sheep, and 15,516 swine. Capital, Millerton.

FREUND, Wilhelm, a German lexicographer, born of Hebrew parents at Kempen, Posen, Jan. 27, 1806. He studied philology in Berlin and Breslau, and in 1828 opened in the latter city a Jewish school, but abandoned this enterprise because of opposition from his orthodox coreligionists. Subsequently he was a teacher in Hirschberg, Silesia, and since 1855 he has been director of a Jewish school at

Gleiwitz established according to his plan. His most important work is the *Wörterbuch der lateinischen Sprache* (4 vols., Leipsic, 1834-'45), which is the basis of Andrews's "Latin and English Lexicon" (New York, 1850).

FREYCINET, Charles L. de. See supplement.

FREYCINET, Louis Claude Desauvages de, a French navigator, born in Montélimart, Aug. 7, 1779, died near Lorient, Aug. 18, 1842. In 1779 he served under Admiral Brueys. In 1800 he accompanied Baudin's expedition to Australia, and being appointed to edit the nautical and geographical portion of the narrative, devoted ten years to this task. In 1817 he was intrusted with the command of a new expedition, the object of which was to study the figure of the globe, the elements of terrestrial magnetism, and certain meteorological phenomena in the southern hemisphere. He returned to Havre in 1820, having sailed round the earth, bringing a great number of observations, charts, and curious specimens for museums. His narrative of this voyage (18 vols. 4to, with four atlases, Paris, 1824-'44) gained him admission into the academy of sciences.

FREYTAG, Georg Wilhelm Friedrich, a German orientalist, born in Lüneburg, Sept. 19, 1788, died in Bonn, Nov. 16, 1861. He studied theology and philosophy at Göttingen, and in 1811 became tutor there, which office he renounced in 1813, through hatred of French domination, and was chaplain in the army of the conquerors which entered Paris in 1815. He resigned his office to study Arabic, Persian, and Turkish under Sylvestre de Sacy, and held the professorship of those languages in the university of Bonn from 1819 until his death. Besides Arabic text books, he published a translation of *Caabi den Sohair Carmen in Laudem Muhammedis dictum* (Bonn, 1822), *Arabum Proverbia* (3 vols., 1838-'44), an edition of the *Fakihat al-Kholafa* by Ibn Arabshah (vol. i., Arabic text, Bonn, 1832; vol. ii., translation, 1858), and the great *Lexicon Arabico-Latinum* (4 vols., Halle, 1830-'37), which was followed by an abridgment in 1837.

FREYTAG, Gustav, a German novelist, born at Kreuzburg, Silesia, July 18, 1816. He studied at the universities of Breslau and Berlin, and wrote poetry and plays, some of which were favorably received. A complete edition of them was published in Leipsic, in 3 vols. (1848-'50). In 1848, jointly with Julian Schmidt, he succeeded Kuranda as editor of the *Grenzboten*, and in 1854 he was appointed councillor of the court and lecturer of the duke of Gotha. In 1855 appeared his novel *Soll und Haben* (16th ed., 1871), which gained for him a wide popularity. It was translated into many languages (English by Mrs. Malcolm, "Debit and Credit," 1858). At the close of 1870 he retired from the *Grenzboten*, to join the newly established weekly journal *Im neuen Reich*. His *Bilder aus der deutschen Vergangenheit* (3 vols., 1859; 4th ed., 1863), *Neue Bilder aus dem Leben des deut-*

schen Volks (1862), *Aus dem Mittelalter* (1866), and *Vom Mittelalter bis zur Neuzeit* (1867) have been published collectively under the title of *Bilder aus der deutschen Vergangenheit* (4 vols., 6th ed., Leipsic, 1871 *et seq.*), part of which has been translated into English.

FRIBOURG, or *Freyburg*. I. A canton of Switzerland, the 9th in extent and in the order of admission into the confederation, bordering on the cantons of Bern and Vaud and the lake of Neuchâtel; area, 648 sq. m.; pop. in 1870, 110,832, of whom 93,951 were Roman Catholics, the Protestants living almost exclusively in the district of Morat. Three detached portions are situated geographically in the canton of Vaud, the largest, with the town of Estavayer, lying on the lake of Neuchâtel; the two smaller ones, Surpierre and Vuissens, are a little south. The surface of the canton is mountainous, especially in the south and east. The principal peaks rise to an altitude of 7,000 ft. and upward. Coal, limestone, limestone slate, and gypsum are found. The principal rivers are the Sarine (Saane), Broye, and Sense. Half of the lake of Morat and a considerable part of the lake of Neuchâtel belong to this canton, which has also several smaller lakes; and there are several mineral springs, all of which are sulphurous. The climate is milder in the north than in the south. The productions in the basins of the rivers are hemp, flax, maize, and fruit; in the northwest, corn, wine, vegetables, and tobacco. In the higher regions cattle rearing and cultivation of the forests are the chief pursuits. The Gruyère (Greierz) cheese is made here, and the great milk establishments of this canton and St. Gall condense 20,000 quarts a day, four fifths of which goes direct to London. Horses, sheep, goats, hogs, chamois, roes, hares, lynxes, a few wild boars, and in the north numbers of wild fowl, are found. The chief articles of export are cheese, condensed milk, and timber. There are limited manufactures of straw hats, leather, tobacco, cotton goods, watches, and silk. The common language is a mixture of French and German in several dialects; the German prevails around the capital and in the district of Morat; the official language is French. In 1870, 26.6 per cent. of the population spoke German, and 73.3 French. All official acts are published in both French and German. The new constitution of March, 1848, revised in 1857, agrees in all essential points with the constitutions of the other cantons. The legislative assembly (the grand council) is chosen for four years by a direct vote of all citizens who are over 20 years old; but 10 additional members are elected by the grand council itself. The state council (executive) consists of seven members chosen by the grand council for eight years. Fribourg sends six members to the national council. There is a Protestant college at Morat. Chief towns, Fribourg, Romont, Bulle, and Morat.—The canton of Fribourg belonged in the middle ages, as a part

of the Uechtland, to Franche-Comté. In 1481 the town of Fribourg with its territory joined the Swiss confederacy by the compact of Stanz. The reformation never got a foothold in Fribourg, and it has ever remained one of the strongholds of the Roman Catholic church in Switzerland. During the civil war of 1847, in which the canton joined the Sonderbund, it was occupied by Gen. Dufour without much opposition. II. A city, capital of the canton, on the Sarine, 18 m. S. W. of Bern; pop. in 1870, 10,904. It consists of the lower (German) town in the narrow valley of the river, and the upper (French) town, which rises like a terrace on a succession of sandstone rocks.



Fribourg

The great glory of the town is the suspension bridge over the Sarine, built in 1831-'4, 870 ft. long, 28 ft. wide, and 174 ft. high. Another suspension bridge spans an adjoining gorge. The principal church, that of St. Nicholas, has the highest spire in Switzerland, and an organ with 64 stops and 7,800 pipes, reckoned one of the finest in Europe. Before the town hall stands the linden tree planted in 1480, on the fourth anniversary of the victory at Morat over Charles the Bold in 1476. Before the expulsion of the Jesuits from Switzerland, in 1847, Fribourg had a celebrated Jesuits' college, founded in 1584, restored to the Jesuits in 1818, and counting from 800 to 400 pupils. It was reopened as a Catholic college, Oct. 15, 1858. There are four public squares,

a mint, arsenal, state prison, town library, lyceum with a cantonal museum, observatory, savings bank, theatre, two public baths, breweries, manufactories of tobacco, chiccoory, straw hats, earthenware, iron tools, and woollen yarn, and several dye houses and tanneries.

FRICTION (Lat. *fricare*, to rub), in mechanics, the resistance caused by the moving of the surfaces of bodies over each other. It is usual to distinguish two kinds of friction, that which is produced when bodies slide one upon another, and that which takes place when they roll one upon another. The term rolling friction is not, however, regarded as strictly correct, and that of resistance to rolling is used instead. The first experiments upon the friction of sliding were made by Amontons, and are described in the memoirs of the academy of sciences, 1699; but his estimates were much higher than those which have since been made. Euler, Désaguliers, and Vince also paid considerable attention to the subject, but the first complete set of experiments were made by Coulomb at Rochefort about 1780. His results, although in some respects since modified, have been of inestimable value to the science of engineering. He employed a bench made of two horizontal timbers 6 ft. long, upon which a loaded sledge was drawn by a weight acting by a cord running over a pulley. The resistance bodies offer to motion after they have been for some time in contact he called the friction of departure. The general conclusions at which he arrived are as follows: 1. Friction is greatest between rough bodies. 2. It is greater between the surfaces of like than of unlike material. 3. The rubbing surfaces remaining the same, friction is proportional to the pressure, and is not increased or diminished by increase or diminution of surface. Some uncertainties in the observations of Coulomb, and the introduction of many new materials in machinery, made it desirable to make a more extended series of experiments. Such were made at Metz in the years 1831, '2, '3, and '4, by M. Morin. The values obtained by him differed in some particulars from those of Coulomb, but the general conclusions at which he arrived were the same. He however established one important fact scarcely to be anticipated, viz., that friction is independent of the velocity of motion. The ratio which the resistance offered to sliding between two surfaces bears to the force with which they are pressed together is called the coefficient of friction, and has greatly differing values between different surfaces, and different conditions of surfaces as to whether they are highly or partially polished, moistened, or lubricated. It has various values between different kinds of wood, depending upon whether the motion is made across or with the fibres, and the condition of the wood; and also between different kinds of metals, and with these depends upon whether they are rolled, hammered, cast, or tempered. Thus the coefficient of friction of motion between

oak and oak in a direction parallel with the fibres was found by M. Morin to be, without lubrication, about $\frac{1}{7}$; lubricated with tallow, about $\frac{1}{10}$; with lard, about $\frac{1}{12}$. When the fibres of one surface were perpendicular to the line of motion, the coefficient was, without lubrication, about $\frac{1}{3}$; lubricated with tallow, about $\frac{1}{4}$; with lard, about $\frac{1}{5}$; with water, about $\frac{1}{6}$. The coefficient of friction between common wrought and cast iron is about $\frac{1}{4}$; of iron on brass, $\frac{1}{5}$; that of an iron axle in a brass box, lubricated, about $\frac{1}{10}$. The least possible friction is found in the use of lubricated steel moving upon hard gems. Coulomb found: 1, that resistance to rolling varies in an inverse ratio with the diameter of the rolling body theoretically, but that in practice small rollers of wood caused more resistance, because of the greater indentation produced, the coefficient ranging from $\frac{1}{10000}$ to $\frac{1}{1000}$; 2, that it is less between heterogeneous than between homogeneous surfaces; 3, that it is directly proportional to pressure; 4, that it has no relation to surface. Upon this principle depends the advantage of using friction wheels and friction rollers in machinery. The application of friction wheels is said to have been first made by Henry Sully in 1716. The friction caused by water in moving over surfaces in conduits is called hydraulic friction. It has been found to be independent of the material of the surface of the conduit, provided it be smooth, but depends considerably on the viscosity of the liquid; thus, ice-cold water offers greater resistance to the passage of a body through it than warm water, and conversely, produces a correspondingly greater degree of friction in moving over surfaces. Friction always develops heat, and precisely in proportion to its amount, as has been established by the experiments of Count Rumford, Davy, Thomson, Mayer, and Joule. By rubbing two pieces of ice together in a vacuum, Sir Humphry Davy partially melted them. Count Rumford found the heat developed in boring a brass cannon sufficient in the course of $2\frac{1}{2}$ hours to raise 26½ lbs. of water from zero to 212° F. At the Paris exhibition in 1855 MM. Beaumont and Mayer exhibited a machine in which a wooden cone covered with hemp made 400 revolutions per minute inside of a hollow copper cone immersed in a tightly closed boiler. With this apparatus 88 gallons of water were raised from 50° to 226° F. in a few hours. In all cases the quantity of heat evolved by friction is exactly sufficient to reproduce the power expended in overcoming the friction; and although in mechanics friction is said to cause a loss of power, there is really no loss of energy, but simply its transformation. Another kind of energy is developed by friction, viz., electricity; and in this case also it has been found that the force produced is precisely proportional to that which was expended in producing it.

FRIDAY, the sixth day of the week, called by the Saxons *Frige daeg*, or day of Frigga (the

wife of Odin), whence our name, and by the Romans *dies Veneris*, or Venus's day. (See GOOD FRIDAY.)

FRIDERICIA, or *Fredericia*, a town and fortress of Denmark, in the S. E. part of the province of Jutland, on the Little Belt; pop. in 1870, 7,186. The town has several sugar refineries, iron foundries, and other industrial establishments, and owns about 25 vessels. Until 1857 the navigation dues were collected here from vessels passing the Little Belt. In 1657 Fridericia was captured by the Swedes. In 1848 it was occupied by the Prussians, subsequently reoccupied by the Danes, and besieged by the Schleswig-Holstein troops. The latter were surprised on July 6, 1849, by the besieged, and forced to a speedy retreat, with heavy loss. In the war of 1864 Fridericia was bombarded by the Germans in March, and hastily evacuated by the Danes in April.

FRIEDLAND. I. A town of Prussia, in the province of East Prussia, on the Alle, 27 m. S. E. of Königsberg; pop. in 1868, 2,478. It has manufactures of linen and woollen cloth and leather, and a trade in cattle. It is memorable for a victory won by Napoleon over the Russians under Benningsen, June 14, 1807, which led to the treaty of Tilsit. The French had between 70,000 and 80,000 men, and lost 8,000 men and two eagles; the Russians, who numbered about 55,000, lost 17,000 men and about 80 guns. Benningsen succeeded in crossing the river and fell back to Tilsit, on the Niemen, where the treaty between the French and Russians was concluded July 7. II. A town of Bohemia, on the Wittich, at its confluence with the Rasnitz, 68 m. N. N. E. of Prague; pop. in 1870, 4,831. It is a walled town, has manufactures of woollen, linen, and cotton cloth, and paper, and a considerable trade. The castle of Friedland, on a conical hill in the S. part of the town, is a picturesque structure surrounded by a lofty wall and surmounted by a high tower. It belonged, with the accompanying lordship, to Wallenstein, who derived from it his title of duke of Friedland. It is now the property of Count Clam-Gallas. III. A town of Germany, in the grand duchy of Mecklenburg-Strelitz, 48 m. N. W. of Stettin; pop. in 1871, 5,081. It is a walled town, and has two churches, one a fine Gothic structure, and a gymnasium. Its manufactures are woollen and linen cloths, copper ware, and tiles. It has three annual fairs and an active trade in cattle; tobacco is also cultivated. The town was founded in 1244 by the margraves John and Otho III. of Brandenburg.

FRIEDRICH, Johann, a German theologian, born at Poxdorf, Bavaria, in 1836. He was ordained a Roman Catholic priest in 1859, became private teacher in 1862, in 1865 professor of theology at the university of Munich, and in 1869 member of the academy of sciences. He has published a number of works, including *Kirchengeschichte Deutschlands* (2 vols., Bamberg, 1867-'9). A follower of Dollinger, he

protested in 1870 against the doctrine of papal infallibility, was expelled from Rome as the reputed author of correspondence in the *Allgemeine Zeitung* adverse to the Vatican, received with Dollinger major excommunication (April 17, 1871), and was formally suspended two months afterward, for having administered the holy sacrament to Dr. Zenger, to whom it had been denied on account of his opposition to the decree of the council of the Vatican. His publications on the subject of papal infallibility and the council comprise *Das päpstlich gewährleistete Recht der deutschen Nation, nicht an die päpstliche Unfehlbarkeit zu glauben* (Munich, 1870); *Documenta ad illustrandum Concilium Vaticanum anni 1870* (2 vols., 1871); and *Tagebuch geführt während des Vaticanischen Concils* (Nördlingen, 1871).

FRIENDLY (or *Tonga*) **ISLANDS**, a group in the southern Pacific ocean, lying between lat. 18° and 28° S., and lon. 174° and 175° 30' W. Tonga is the native name of the group. They were discovered by the Dutch navigator Abel Tasman in 1643, and visited and described in 1778 and 1777 by Cook, who gave them the name of Friendly from the apparently hospitable reception he met with from the inhabitants. It has since been ascertained that the character of the natives is no better than that of the other Polynesians, and that they were only deterred by fear from attacking Cook. They consist of about 32 greater and 150 smaller islands, about 80 of which are inhabited; pop. estimated from 25,000 to 50,000. The islands are mostly of coral formation, and are surrounded by dangerous coral reefs. A few are of volcanic origin, and in Tofooa there is an active volcano. They are divided into three groups, viz.: the Tonga at the south, the Hapai in the centre, and the Vavao at the north. The climate is healthy, but humid; much rain falls, and none of the islands are destitute of fresh water. The mean temperature during the stay of the United States exploring expedition at Tongataboo (April, 1840) was 79°-25°. The trade winds are by no means constant. Earthquakes are frequent, but not formidable; hurricanes both frequent and destructive. The natives cultivate yams, sweet potatoes, bananas, cocoanuts, breadfruit, sugar cane, shaddock, limes, and the *ti* (*spondias dulcis*); the pandanus is one of their most useful trees, of which they make their mats; a little corn is grown, and they have the papaw apple (*papaya*) and watermelon. The missionaries have successfully introduced the sweet orange from Tahiti, but many other imported fruits and vegetable seeds have failed. The flora resembles that of the Feejee group. The hog, dog, and rat are the only native quadrupeds. Tongataboo, or Sacred isle, is the principal island. It is about 20 m. long and 12 broad; it is low and level, of coral formation, and rises nowhere more than 60 ft. above the sea. In pagan times it exercised a sort of religious supremacy over the other islands. The only important article of

export from the Friendly islands is cocoanut oil. Port Refuge in Vavao is the best harbor, and is much frequented by British and American whalers. The port of Bea on Tongataboo is celebrated as the place where in 1840 Capt. Croker, of H. B. M. sloop Favorite, was defeated by the pagan party. In this engagement, undertaken in behalf of the Christian missionaries and their native partisans, Croker and many of his officers and men were slain. The Friendly islanders contrast favorably with their neighbors, the Feejeeans, in appearance and disposition. The islands were formerly governed by several independent chiefs. The northern and middle groups afterward constituted the state of Vavao, under the sway of a native Protestant prince called King George, who is said to have since become the ruler of all the islands. When pagans, the natives were devoted to war; the women went nearly naked. They offered human sacrifices, and cut off their little fingers and toes as propitiatory offerings to their gods. Their mythology,

ary: "In the pulpit he was dressed in a black coat, and his manner was solemn and earnest. He held in his hand a small bound manuscript book, but seldom looked at it." Later, Catholic missionaries came to these islands from France, and firmly established themselves in the southern group, where a large portion of the natives have joined the Catholic church. Intercourse with the eastern islands of the Feejee group is frequent, and many Tongese have emigrated thither.

FRIENDS, a sect of Christians commonly called Quakers, which was founded in England about the middle of the 17th century. At first they were known as the "Professors of the Light" or "Children of the Light," from "their fundamental principle," says William Penn, "which is as the corner stone of their fabric, and indeed, to speak eminently and properly, their characteristic or main distinguishing point or principle, viz., the light of Christ within, as God's gift for man's salvation; the root of the goodly tree of doctrine that grew and branched out of it." They soon adopted the name of "the Religious Society of Friends," by which they are always known among themselves. The origin of the name Quaker is not entirely certain. By some it is affirmed that it was given "in derision, because they often trembled under an awful sense of the infinite purity and majesty of God." By others it is said that it was first applied to them in 1650, when George Fox was brought before the magistrates of Derby, and he having told them to "quake at the name of the Lord," one of them, Gervase Bennet, an Independent, caught up the word, and, says Fox, "was the first that called us Quakers." However the name originated, it soon became the one by which they were generally known in all parts of the world. The sect was founded by George Fox, a native of Drayton, Leicestershire. He was apprenticed to a shoemaker, but in 1648, at the age of 19, he left his master and wandered about England, leading a solitary life and passing most of his time in meditation and in reading the Scriptures. In the latter part of 1647, under the conviction of a divine call, he began the life of an itinerant preacher, and went from place to place exhorting all who would hear to repentance and the commencement of a new life. He denounced the coldness and insufficiency of all existing forms and ceremonies of religion, and asserted that the office of a Christian teacher had become a mere trade, denied the necessity of any special education for it, and maintained that the only warrant for assuming it was the consciousness of a divine summons to enter upon its duties. He denounced a paid ministry, and declared it to be a sin to pay tithes. He denounced war even when waged in self-defence, and urged upon all to refuse to do military duty. He asserted the equality and brotherhood of all men, and used the second person singular in addressing all persons of whatever rank. He would not uncover his head in any

A Cromlech at Tongataboo.

like that of the other Polynesians, was a low type of polytheism. The spirits of all chiefs go to Bulotu; those of the poor people remain in this world to feed upon ants and lizards. They represent the island of Bulotu as not far distant, but do not attempt to settle its precise position. Nearly all the people are now Christian. They were first visited in 1797 by agents of the London missionary society, but in 1827 came under the charge of the Wesleyan society of Great Britain. The group is divided into three missionary stations, viz.: Tongataboo and Hapai, commenced in 1829, and Vavao, in 1830. The smaller islands are intrusted to the supervision of native teachers, and are visited occasionally by the missionaries. A printing press has been in operation at Vavao since 1832. Many of the women can sew, and a great number of the natives have learned to read and write, both in their native tongue and in English; a few have been taught arithmetic and geography. King George is a constant preacher, and is thus described by a mission-

presence, not even when brought before the courts of law. He declared every form of oath to be a profane violation of the express command of the Lord. He put a literal construction upon all those precepts of the gospel which seem most difficult to be carried out in real life, and gave to them a literal obedience. On one occasion, when brought before a court, the clerk struck him in the face because he refused to remove his hat, and he calmly turned the other cheek in readiness for another blow. For four years Fox was the only preacher of his doctrines. The second who entered upon that office was a woman named Elizabeth Hooton. Soon 25 preachers were engaged in promulgating the doctrines of Fox, and in the seventh year of his preaching there were more than 60. The age was one in which religious toleration was neither understood nor practised. There were several powerful sects, each animated with a blind zeal for its own opinions and a fierce hatred of the opinions of all others. The peculiarities of the Quakers immediately brought persecution upon them, which had the usual effect of attracting attention to its victims. From 1652 until the death of Fox in 1691 their numbers rapidly increased, and among them were many persons of high social standing. Of these the most prominent were William Penn and Robert Barclay, the former a man of great experience in practical affairs, the latter one of the most learned and able writers of his time. They as well as Fox were repeatedly fined and imprisoned, but this treatment only confirmed their faith, attracted public notice and sympathy, and increased the number of their followers. The persecutions inflicted upon the Quakers during the first 40 years of their existence have hardly a parallel in the history of the last two centuries. Bad as are many of our prisons now, they are places of comfort compared to the loathsome dungeons of the 17th century. In their pestilential cells there were confined at one time more than 4,000 Quakers. In 1662, 20 died in the jails of London alone; in 1664, 25; in 1665, 52; and many others died after being set at liberty, in consequence of their sufferings while in prison. All the old statutes of Henry VIII. and Elizabeth which had been passed against the Papists and other recusants were brought to bear against them, and new and cruel statutes were passed to torment them in cases when the old ones failed to reach them. The most grievous fines, a large portion of which went to the informers, were inflicted upon them. They were insulted with impunity by the lowest of the populace; their women and children were dragged by the hair along the streets, their meeting houses were stripped of windows and doors or nailed up. In 1670 an order of the king, signed by the archbishop of Canterbury and thirteen others, directed Mr. Christopher Wren to pull down the Quaker meeting houses in Ratcliffe and Horsleydown. It was done, and the materials were sold. When they met

in the open air by their ruined meeting houses, they were driven away by soldiers, who beat them over the head with the butts of their muskets, and in this way many of them were killed. Constables and informers broke into their houses and carried off their food and their tools. On the Quakers of Bristol there were levied at one time fines amounting to £16,400, and the value of their property destroyed in England during this period of their tribulation amounted to more than £1,000,000. In 1686, when, partly through the influence of Penn, a proclamation was issued by the king and council releasing all persons imprisoned on account of religion, among those set at liberty were 1,490 Quakers. When brought before the magistrates, if all other charges failed, they were required to take the oath of allegiance and supremacy. To the matter of the oath they made no objection, but swear to it they would not. They resolutely refused to violate the divine command, "Swear not at all," which they construed literally, and to which they believed there was no exception. Their goods were continually seized in consequence of their refusal to pay tithes, and their refusal to bear arms or enroll themselves in the military force of the country excited alike the hatred and the contempt of their fellow subjects. On the other hand, the purity of their lives, the patience with which they endured insult and persecution, never returning evil for evil, their zeal, their devotedness, and their love for each other, often compelled the admiration even of their opponents. To escape persecution many of them emigrated to the continent, to the West Indies, and to America. But in the two latter countries they immediately became the victims of persecution. In September, 1656, two Quaker women, Mary Fisher and Ann Austin, arrived in Boston from Barbadoes. Before landing their trunks were searched and their books taken and burned by the common hangman. They were thrown into prison, stripped, and their persons searched for signs of witchcraft. None were found, but after five weeks' imprisonment they were convicted of heresy, and according to the law in such cases they were "thrust out of the jurisdiction;" in other words, expelled from Massachusetts. Nine others, men and women, who arrived soon after from London, were similarly treated. The severity of the laws against them was increased from year to year. From 1658 to 1661 three men and one woman were hanged. They had been banished from the colony on pain of death if they returned. They came back openly defying the courts, and were arrested to their great satisfaction. Many more were sentenced to death, but were not executed. In Rhode Island they were not interfered with in any manner, and very few of them went there at first; but from 1672 they increased rapidly, and in 1674 William Codrington, who had become a Quaker after found-

ing the colony, was reëlected governor. In Virginia laws modelled after those of Massachusetts, though somewhat less severe, were enacted against them; and in Maryland, where religious toleration was professed, they were punished, not as heretics, but as "vagabonds who persuade the people from complying with military discipline, from holding offices, giving testimony, and serving as jurors." After the foundation of Pennsylvania by Penn in 1682 great numbers of Quakers under his patronage emigrated thither, and at the present time they are more numerous and influential in that than in any other of the United States. In England the persecutions of the Quakers were greatly mitigated by the passing of the toleration act in 1689, but more by the growing spirit of toleration among the people at large. In 1722 a statute was enacted allowing their affirmation to be taken instead of an oath in all legal proceedings. But they have never been exempted from the payment of tithes, and, as they refuse to pay voluntarily, they are annually collected by distraint. During all their persecutions the Quakers never showed any spirit of retaliation. When urged to denounce their enemies they invariably answered, "We leave them to the Lord." A majority of the early preachers of their sect died in prison, and the hardships endured in prison shortened the lives of many others, including Fox; but they bore all patiently and unflinchingly.—When we consider the age in which Quakerism took its rise and the nature of its principles, we can wonder neither at the treatment they received nor that they often acted in a manner which to others seemed extravagant and revolting. The civil war between the supporters of the crown and the supporters of the parliament was just drawing to a close. Men's passions were at fever heat, and their opinions in a perpetual ferment. New theories of government and new creeds in religion were constantly springing up, and all were supported with fanatical zeal. In the midst of all this George Fox appeared, denouncing all war, all forms and ceremonies, disgusting the cavaliers by his invectives against worldly pleasures, and enraging the puritans by his denunciations of intolerance. Professing themselves to be guided by the "light, grace, and spirit of Christ, inwardly revealed," the Quakers yet asked for no privilege for themselves that they were not willing to concede to others. They advocated entire freedom of opinion and expression for Protestant and Catholic, for Christian and infidel. The nature of their doctrines and the persecutions inflicted upon them aroused in many a zeal and enthusiasm hardly distinguishable from insanity. Some entered churches during the hours of service, and called upon preacher and congregation to repent of their sins. Some went about clothed in sackcloth and with ashes upon their heads; others even appeared in the streets naked. They had visions, and addressed warnings to magistrates

and governments. Many believed themselves gifted with the spirit of prophecy. Fox, in his journal, records that, meeting Cromwell a few days before his death in Hampton Court park, he "perceived a waft of death go forth from him." The society still preserve the names of those who foretold the death of Cromwell, the great plague in London, the great fire, and other remarkable events. These were, however, exceptional cases, and generally the Quakers have been remarkable more than all other men for their quiet, staid, and sober demeanor. The peculiar dress of the Quakers is too well known to need description; but it is a mistake to suppose that it was originally adopted as a mark of distinction from other sects. In its essential characteristics it does not differ from the dress worn by large numbers of people at the time when Quakerism took its rise. But change in obedience to the dictates of fashion was in their estimation one of the vain follies of the world. While the fashions changed they adhered to their original garb, and thus by the force of contrast it has come to be regarded as an essential characteristic of the sect. But in their dress as in everything else they endeavored to carry out one of the main principles which they professed in regard to practical life. They believed in and inculcated the utmost plainness and simplicity; nothing for show, nothing for ornament, nothing for pleasure. The construction and interior arrangements of their meeting houses were the simplest possible. Believing that no one was authorized to speak in a religious assembly except as on each particular occasion he was moved thereto by an immediate divine inward impulse, they have no pulpits. A row of benches slightly elevated above the rest is appropriated to the more venerable members, and especially to those who oftenest feel this divine impulse to address their brethren. The men sit upon one side of the house, the women upon the other. They enter, and without uncovering their heads take their seats in silence. Men and women are alike entitled to speak if they feel impelled thereto. If no one feels this impulse, each, when he or she sees fit, arises and departs in silence. They have no ceremonies, no liturgy, no stated form of prayer, and no regular preaching. It is said that in some places they have thus met for several years in succession without any one speaking a word.—The founders of the society did not profess to have discovered new truth or to aim at the establishment of a new creed. They sought to effect a reform in manners rather than in belief. They desired to persuade men to live in the way in which they conceived that the primitive Christians lived. They professed their belief in the fundamental doctrines of Christianity as they were generally understood among Protestant Christians. Hence their members were not and are not required to subscribe to any articles or specific declaration of faith. The forms in which they prefer

to have the Christian doctrines stated must be sought in the writings of their most approved authors, and in the minutes and epistles of their yearly meetings. In the words of one of these documents, they believe that "every man coming into the world is endued with a measure of the light, grace, and spirit of Christ, by which, as it is attended to, he is enabled to distinguish good from evil, and to correct the disorderly passions and corrupt propensities of his nature; and that without the spirit inwardly revealed, man can do nothing to the glory of God, or to effect his own salvation." The following statement of their doctrines, discipline, and organization was prepared under the authority of the Philadelphia yearly meeting, and presents them as they are maintained by that portion of them who claim to be the orthodox representatives of the original founders: "They believe in one God, the creator and upholder of all things; and in his Son, the Lord Jesus Christ, by whom are all things; and in the Holy Spirit which proceedeth from the Father and the Son: one God, blessed for ever. In treating of the Three that bear record in heaven, they prefer keeping to the language of Holy Scripture, which sometimes induced their opponents to accuse them of unsoundness. This was the case in the controversy which led to the writing of William Penn's 'Sandy Foundation Shaken.' He says the question between him and his opposer was, 'whether we owned one Godhead subsisting in three distinct and separate persons.' The latter words Penn argued against as unscriptural, but to prevent a misconception of his views, says: 'Mistake me not, we never have denied a Father, Word, and Spirit, which are one; but men's inventions;' and at different periods of his life he strenuously repelled the charge of Socinianism as regarded himself and the society. The same applies to his argument respecting the doctrine of Christ's satisfaction; for while he rejects the school terms in which his antagonist dressed it, he quotes numerous passages of Scripture proving that our Lord Jesus Christ, in his suffering and death, was a most acceptable sacrifice and propitiation for the sins of mankind. They own and believe in Jesus Christ, who was conceived of the Holy Ghost and born of the Virgin Mary, in whom we have redemption and pardon through his blood, even the remission of our sins; that he was a most satisfactory sacrifice for the sins of the world, being crucified without the gates of Jerusalem, rose from the dead the third day, ascended into heaven, and now sitteth at the right hand of God, our holy mediator, intercessor, and advocate with the Father. They have uniformly believed that he is true God and perfect man in wonderful union, and that the forgiveness of sins which any partake of is only by virtue of his sacrifice. That the Holy Spirit whom Christ said he would send leads and guides his followers into all truth; that a manifestation of

this Spirit is given to every man to profit withal, which convicts of sin, and, as it is obeyed, gives power to overcome and forsake it; that it enables savingly to understand the Holy Scriptures, and gives the living experience of those things which belong to the soul's salvation. Man was created in the image of God, capable of understanding and obeying the divine law, and of holding communion with his Maker. Through transgression he fell and lost this heavenly state. His posterity come into the world in the image of the fallen earthly man, and until renewed by the regenerating power of Christ Jesus, they are dead to the spiritual life in which Adam originally stood, and subject to the power of Satan; and their imaginations, words, and deeds are evil. Man therefore in this state can know nothing aright respecting God; his thoughts and conceptions of spiritual things being unprofitable, until he is renewed and quickened by the Holy Spirit. What was lost in Adam is made up in Christ; and the guilt of Adam's sin is not imputed to any until they make it their own by transgression. There will be a resurrection of the righteous and the wicked, the one to eternal life and blessedness, the other to everlasting misery; and God will judge the world by Christ Jesus. That the Holy Scriptures were written by divine inspiration, and contain a declaration of all the fundamental doctrines and principles relating to eternal life and salvation; and that whatsoever doctrine or practice is contrary to them, is to be rejected as false. The society does not call them the Word of God, this term being peculiarly applied in them to the Lord Jesus; yet it believes them to be the words of God, written by holy men as they were moved by the Holy Ghost, and that they are able to make wise unto salvation through faith which is in Christ Jesus. It looks upon them as the only fit outward judge and test in controversies among Christians, and is very willing that all its doctrines and practices should be tried by them, freely admitting that whatever any profess or do, pretending to be guided by the Spirit, which is contrary to the Scriptures, be condemned as a delusion. As there is one Lord and one faith, so there is one baptism, of which the water baptism of John was a figure. The baptism which saves the soul is not dipping in or sprinkling with water, but the answer of a good conscience toward God, by the resurrection of Jesus Christ. This answer of a good conscience can only be produced by the washing of regeneration and the renewing of the Holy Spirit, transforming the heart and bringing the will into conformity with the will of God. The communion of the body and blood of the Lord Jesus Christ is inward and spiritual, a real participation of his divine nature, through living faith in him and the power of the Holy Spirit, by which the soul is enabled daily to feed upon him and experience spiritual nourishment; the true Christian supper being that set forth in

the book of Revelation: 'Behold I stand at the door and knock; if any man hear my voice and open the door, I will come in to him, and will sup with him, and he with me.' Divine worship must be performed immediately between the soul and its Maker. No man can do it for another. It is therefore the practice of Friends to sit down in solemn silence to worship God, that each one may strive to gather inward to the gift of divine grace in order to receive ability to worship the Father of spirits in spirit and in truth, and offer to him, through Christ Jesus our holy Mediator, an acceptable sacrifice, whether in silent mental adoration, the public ministry of the gospel, or vocal prayer and thanksgiving. The call, authority, and qualification for gospel ministry are from Christ Jesus alone, who dispenses them to both men and women, as he sees fit, without regard to rank, learning, or human selection and appointment; and they must be received immediately from him through the revelation of his Spirit in the heart. The command, 'Freely ye have received, freely give,' is of lasting obligation, and the gospel is to be preached without price; hence the society has borne a constant testimony against a paid ministry, which derives its authority from human learning and ordination, which does not acknowledge a dependence for the performance of it upon the renewed motion and aid of the Holy Spirit. War is wholly at variance with the spirit of the gospel, which continually breathes peace on earth and good will to all men. When the reign of the Prince of Peace is set up in the hearts of men, 'nation will not lift up sword against nation, nor will men learn war any more.' The words of Christ, 'Swear not at all,' and of the apostle James, 'Swear not, neither by heaven, nor earth, nor by any other oath,' forbid all swearing of every kind. The fast to which Christians are called is not the observance of any particular day set apart by man, but a continual fasting from sin; and therefore Friends cannot conscientiously join in public fasts or holy days, so called. They hold that under the gospel there is no inherent holiness in one day more than another, but that all are to be kept holy; and they do not pay a superstitious reverence to the first day of the week, but as it is necessary that some time should be fixed to meet to worship God, and that men should be free from outward affairs, and that laborers and beasts should have time for rest, and as the primitive Christians used the first day for these purposes, therefore Friends observe that day as a time of rest, and for religious retirement and waiting on God. The enslaving of the human species is entirely opposed to the commands of Christ and the spirit of his religion, and the society bears a testimony against the system; also against the unnecessary use of intoxicating drinks. It enjoins upon its members plainness and simplicity in dress, language, and behavior; moderation in the

pursuit of business; and that they discountenance lotteries and games of chance, music, dancing, stage plays, horse races, and all other vain and pernicious amusements and practices."—As all who regularly attend the meetings of Friends, as well as their children, are viewed as members, Fox saw that some system of church government was necessary by which their conduct might be regulated and controlled. Hence he early began the establishment of meetings for discipline. The first objects of attention of these meetings were the care of the poor, the maintenance and education of orphans and poor children, the orderly accomplishment of marriages, the registry of births and deaths, the granting of certificates of approval to ministers travelling abroad, and preserving an account of the sufferings of Friends in support of their religion. While it was to be expected that offences would arise, it did not necessarily follow that the erring one must be cut off; and measures were adopted for extending brotherly labor, in the spirit of love and meekness, for the restoration of such. When brought sincerely to condemn his error and amend his way, a brother is gained; and if this desirable result is not attained, the church testifies against his misconduct and declares that he is no longer a member of it. This is the extent of the censure pronounced by the society, and its proceedings are founded on the directions given by our Lord in Matt. xviii. 15-20. The disciplinary care of the society was also exercised to preserve its members from denying or impugning its Christian principles. At different periods persons have been disowned for such errors as "denying the divinity of our Lord and Saviour Jesus Christ, the immediate revelation of the Holy Spirit, or the authenticity of the Holy Scriptures." There are four grades of meetings for discipline: first, preparative, which prepare business for the second or monthly meetings, in which the executive power is chiefly lodged; then the quarterly meetings, consisting of several monthly meetings, and exercising a supervisory care over them; and lastly the yearly meetings, which include the whole society within a prescribed district, possess exclusively the legislative power, and annually investigate the condition of their subordinate meetings. In each preparative meeting there are usually two or more Friends of each sex chosen as overseers to take cognizance of any improper conduct of the members, to admonish them in love, and if necessary report the case to the preparative meeting. From this it generally goes to the monthly meeting, where a committee is appointed to endeavor to convince and reclaim the offender. The women have similar meetings and the like order and care for the help and preservation of their members, but take no part in the legislative proceedings of the society. There are also distinct meetings for the oversight and help of

the ministry, composed of ministers and elders, the latter being prudent religious Friends chosen especially to have the care of the ministry. To monthly meetings belong the requisite care for the reception of persons into the society, the application for that purpose being first made to the overseers; also the granting of certificates of membership to Friends moving from their limits, the allowance and oversight of marriages, the free education of the children of the poor, and the maintenance of such members as are unable to support themselves. When a member believes himself or herself divinely called to speak in the religious meetings of Friends as a minister, after a sufficient time has been allowed to make proof of the call, if the preparative meeting of ministers and elders unite in the judgment that a gift of gospel ministry has been committed to the individual, it so reports to the monthly meeting; and if this comes to a like decision, it forwards the case to the quarterly meeting of ministers and elders; and when it also unites in the conclusion of the others, the person is recorded as an approved minister.—In 1827 a rupture occurred in the society of Friends in the United States, caused principally by the preaching and influence of Elias Hicks, who had been a noted preacher in the society since the commencement of the revolutionary war. He was a man of great energy, purity of character, and natural eloquence. He travelled extensively in the United States and Canadas, and everywhere his preaching, at first mainly practical and devotional, attracted a crowd. He gradually devoted more attention to the discussion of doctrinal points, and his views in regard to the divinity of Christ and the nature of the atonement were regarded by a large portion of the society as inconsistent with the doctrines of orthodox Christianity. His opinions became the subject of animated discussion. Parties were formed, pamphlets written, and periodicals established by his adherents and opponents, the former maintaining that his doctrines were in accordance with those of the early founders of the society, the latter that they were not only contrary to the original doctrines of the Friends, but to the generally admitted doctrines of orthodox Christianity, and tended to total unbelief. The opponents of Hicks charged him with “denying, or at least holding lightly, a belief in the true divinity of Christ while incarnate, and in the atoning, cleansing, saving efficacy of his blood which was shed for us.” In the statements of their belief in regard to the nature of Christ there seems to be on the part of the supporters of Hicks a manifest leaning to Socinianism; but they contended that they were in strict accordance with the teachings of Fox, Penn, and Barclay. In regard to the atonement Mr. Janney, one of their most prominent men, says: “The doctrine that God cannot or will not forgive sins without a compensation or satisfaction, and that man not being able to make this

satisfaction, it was made by Jesus Christ, who was appointed or given up to be killed for this purpose, is so inconsistent with the divine character that it cannot be reconciled with the teachings of the Son of God.” After the discussion had lasted many years, the first separation took place in 1827, when Hicks was nearly 80 years old. Six of the ten yearly meetings then existing in the United States were rent asunder, the followers of Hicks, about one third of the whole society, forming six new “meetings.” Both parties claimed to be the true representatives of the society and continued to call themselves “Friends,” but they are generally known by the names “Orthodox” and “Hicksites.” The division never extended beyond the United States, and was greatly regretted by the members of the society in other countries.—In England, of late years, there has been a growing tendency among the Quakers to relax the rigidity with which they adhered to mere outward peculiarities, and to conform more and more to the customs of the rest of the world in dress, language, and manners. Large numbers of them encourage the practice of vocal music, and even allow dancing in their families. Many favor the arts of painting and sculpture, purchasing such works as they have satisfied themselves are of a strictly moral tendency.—The Quakers have probably never at any one time exceeded 200,000 in number. But the purity of their lives and their constant outspoken testimony against all immorality, war, intemperance, and especially against slavery, have exercised an influence over the opinions and practice of the civilized world altogether greater than that of any other body of men of no greater numbers that has existed in modern times. The number of Quakers in the United States is probably at present about 100,000, and in all other countries about half as many. They are increasing in numbers, though not rapidly. They have many excellent schools, and pay especial attention to their first-day schools. In 1868 a foreign missionary society was formed, and established missions in India and Madagascar. They have also been active in the establishment of schools among the freedmen and in their efforts to ameliorate the condition and infuse a more Christian spirit into the treatment of the American Indians.

FRIES, Elias Magnus, a Swedish botanist, born Aug. 15, 1794, died Feb. 8, 1878. He was appointed adjunct professor of botany at Lund in 1819, and professor in 1828. In 1834 he was called to the chair of economy at Upsal, to which in 1851 that of botany was attached, and in 1853 he was made rector of the university. As director of the museum and botanical garden of the university, he introduced important improvements. He was also distinguished as an orator, and twice represented the university of Upsal in the diet. His most valuable work is *Summa Vegetabilium Scandinavica* (2 vols., Upsal, 1846-'8). He has also published

over 100 dissertations and numerous treatises on botany, especially on mycology.

FRIES, Ernst, a German painter, born in Heidelberg, June 22, 1801, died in Karlsruhe, Oct. 11, 1883. He studied at the academy of Munich, travelled through Germany, Tyrol, and Switzerland, and resided four years in Italy. Most of his landscapes depict Italian scenery, and have been compared to those of Poussin. Some of his finest pictures are in Hamburg and other German cities, but most of them are in foreign countries.—His brother **BERNHARD**, born in Heidelberg, May 16, 1820, is also distinguished as a painter, especially of Italian and Alpine scenery.

FRIES, Jakob Friedrich, a German philosopher, born at Barby, near Magdeburg, Aug. 23, 1773, died in Jena, Aug. 10, 1843. He was educated in a Moravian school, and studied philosophy at Leipsic and Jena. He passed several years in Switzerland as a private teacher, and became professor of philosophy successively at Heidelberg and Jena. Being deprived of his professorship for having taken part in the democratic movement of 1819, he was in 1824 appointed to the chair of physics and mathematics in the latter university, which he held till his death. His works include *Neue oder anthropologische Kritik der Vernunft* (2d ed., 8 vols., 1828-'31), and many other writings, chiefly upon problems of speculative philosophy. Proceeding from Kant, he inclines to the doctrine of faith as developed in the system of Jacobi. He maintains that there is only subjective certainty, that mental phenomena are the only objects of knowledge, but recognizes a principle which he names faith, by which we have a presentiment of the existence of outward things, and of the eternal existence of the ideas of the pure reason.—See *Jakob Friedrich Fries*, by E. L. T. Henke (Leipsic, 1867).

FRIESLAND, or *Vriesland* (ano. *Frisia*). I. A N. province of Holland, sometimes called West Friesland to distinguish it from East Friesland in Hanover, bounded N., W., and S. W. by the North sea and Zuyder Zee, E. by the provinces of Groningen and Drenthe, and S. by Drenthe and Overijssel; area, 1,264 sq. m.; pop. in 1871, 296,931, of whom about 268,000 were Protestants and 24,000 Catholics. The surface is mostly flat, many parts of it being lower than the level of the sea, from the encroachments of which it is protected by dikes. It is intersected by numerous draining canals, the principal of which is the Great canal, extending from Harlingen on the W. coast, through Franeker, Leeuwarden, and Dokkum, to Groningen. The whole management of the canals, dikes, &c., is vested in a board, and the expense of keeping them in repair is met by a tax levied on the land owners. The only river worth mentioning is the Lauwers. There are many small lakes. Dairy farming is very extensively carried on. The chief manufactures are woollen stuffs,

linen, sail cloth, salt, paper, starch, spirits, hardware, and tiles. A considerable portion of the people are employed in digging turf for fuel, and fishing. Capital, Leeuwarden. II. **East**, an old principality, now mainly comprised in the district of Aurich in the Prussian province of Hanover; pop. in 1871, 25,894. It was part of the territory of the ancient Frisians, and in the 18th century passed to Prussia. Napoleon I. took it from the latter in 1806, but it was restored after the peace of 1814, and a little later was ceded by Prussia to Hanover. In 1866 it was with the remainder of Hanover absorbed by Prussia. (See **FRISIANS**.)

FRIGATE BIRD (called also frigate pelican and man-of-war bird), a tropical web-footed bird, belonging to the family *pelecanidae* (Gray), and to the genus *tachypetes* (Vieillot). The bill is longer than the head, strong, hooked at the end, and sharp; wings long and pointed, the first two quills the longest; the tail lengthened, deeply forked, of 12 feathers; the tarsi short and strong, feathered for half their length; toes long, united by a deeply indented web; claws curved, small, and pectinated, the latter character (according to Audubon) enabling the bird to remove insects from parts of the body and head beyond the reach of the bill; at the base of the lower mandible is a small orange-colored sac, capable of distention. The neck is short and stout, and the body slender; the plumage is compact, the eyelids, sac, and front of the upper neck bare. The color of the adult male, in the fourth year, is brownish black, with green and purple reflections; the wings are tinged with gray and brown; the tail dark brown, the shafts white underneath; bill pale purplish blue, white in the middle, and dusky at the tip; iris dark brown; feet reddish above, orange below. In the female the sides of the neck and a broad space on the breast are white, the wings and tail more brown, and

Frigate Bird (*Tachypetes aquilus*).

the plumage of the back less shining. The length to end of tail is 41 in., the extent of wings 7 ft. or more, and the weight about 8½ lbs. Only two species are described by Gray, the *T. aquilus* (Vieill.), very generally distributed in the tropical regions of the globe,

and the Australian species, *T. aris* (Gould). In proportion to their size, their wings are longer than in any other bird; their flight is so powerful that they are seen more than 1,000 m. from land, and so rapid that they descend upon their prey with a velocity surpassing that of the swiftest falcons; they can glide smoothly along like a kite, and breast the hurricane without apparent effort, rising with ease above the tempest clouds whenever they please; they often fly in flocks so high as to be scarcely visible. They move with great difficulty on land, and rarely alight on the water; by raising the wings perpendicularly and spreading the half-erect tail, they readily ascend from a level surface. They do not dive in search of food, but obtain it on the wing; the smallness of the webs prevents them from being good swimmers. The food consists principally of fish, which their acute sight enables them to detect from a great height; when one sees a shoal of fish, he swoops rapidly down, but does not plunge, quickly changing his course and swimming along the surface with the neck and feet stretched horizontally; then raising the wings above the back, and fixing them one against the other, the bird darts at its prey, which it rarely fails to seize. It follows the shoals of flying fishes, and catches them in the air; it also picks up dead fish and floating garbage like the gulls; during the nesting period young birds form a favorite article of food, its own nestlings suffering in like manner from the turkey buzzards. But its favorite way of providing for its wants, and that which has given it its warlike name, is that pursued by the bald eagle with the fish hawk; possessing great strength, and with superior power of wing, it pursues the terns and gulls which have secured a fish, and by beating them with wings and beak forces them to drop or disgorge it; then descending with great rapidity, it seizes the prey before it reaches the water. It is believed by some that frigate birds harass the pelicans and boobies in this manner, but Audubon and others say that this is not the case, as these large birds, with a single stroke of their powerful bills, could easily destroy their aggressors. They are very quarrelsome, and the robbers despoil the original thief whenever opportunity offers. With all this strength of wing, Audubon says the keel of the sternum is no more developed than that of the short-flying grouse and partridge, showing the insufficiency of this bony crest as a means of indicating the power of flight. They are not shy; when shot at and wounded they disgorge the contents of the stomach, generally of the most fetid character; their only note is rough and croaking, and very seldom uttered; the flesh is totally unfit for food. They are rarely found further north than Charleston, S. C., but are abundant in the south from Florida to Texas, and in California. These marine vultures, as they have been called, breed in great numbers on the

Florida keys, generally making their nests of coarse sticks in mangrove trees, beginning about the middle of May; the eggs are two or three, about three inches long and two broad, of a greenish white color; the young grow slowly, and are fed by regurgitation.

FRIGGA. See ODIN.

FRINGE TREE (*Chionanthus Virginica*, Linn.), a beautiful tree of 10 to 80 ft. in height, with somewhat oval, smooth, entire leaves, white, narrow-petalled flowers in drooping racemes, and oval, purple drupes, growing wild from Pennsylvania southward to the gulf of Mexico. It belongs to the *oleaceæ*, and is hence a relative of the olive and the ash. Its light and pure clusters of blossoms are not only suggestive of its English name, but of the generic title of *chionanthus*, blossoms of the snow. It is of rather slow growth, and is not hardy north of central New York; but where it will endure

Fringe Tree (*Chionanthus Virginica*).

the climate it is well worthy of cultivation. Some of the nursery catalogues offer the varieties *angustifolia*, *latifolia*, and *maritima*, which differ somewhat from the type in size and shape of the leaves and flowers.

FRIO, a S. W. county of Texas, intersected by the Rio Frio and Rio San Miguel; area, 1,050 sq. m.; pop. in 1870, 809, of whom 15 were colored. The surface is diversified; there is good farming land along the rivers, and considerable timber. Stock raising is the leading pursuit. The chief productions in 1870 were 8,080 bushels of Indian corn and 13,948 lbs. of wool. There were 1,278 horses, 60,834 cattle, 5,284 sheep, and 2,095 swine.

FRISIANS, a Germanic people, inhabiting the N. W. coasts of Germany, portions of Holland, and some adjacent islands. The Romans called them *Frisii*; Ptolemy, *Φρισιοι*; the ancient Norsemen, *Frisir*; the Anglo-Saxons, *Fresena cyn*; the old High Germans, *Friesen*; and the ancient codes of the people, *Frisa* or *Fresa*. Their name is believed to signify free. Caesar

makes no mention of them, but Pliny knew that they dwelt beyond the Batavians. They were conquered by Drusus, but soon regained their liberty as allies of the Batavians. The name Frisian was subsequently extended to the Chauci, a kindred race living east of them, who ceased to be an independent and distinct people before the beginning of the 4th century. The advance of the Franks pushed the Frisians to the very coast of the North sea. They attempted many times to repel their aggressors; but centuries of feuds and an invasion of Britain in the 5th century diminished their number, and Pepin of Héristal gained a decisive victory over them in 689. A century later the empire of the Franks extended as far as the Weser. The Frisians were converted to Christianity; their rights and privileges were laid down by Charlemagne in the *Lex Frisionum*, and to protect them against the inroads of the Norsemen a *ducatus Frisia* was formed. The S. W. Frisians were the first to lose the characteristic features as well as the laws and the language of their race, and in the 18th century the name of Friesland belonged only to the district east of the Zuyder Zee, which the Lauwers divided again into East and West Friesland. The Frisians inhabiting the region between the Lauwers and the Vly outlet of the Zuyder Zee offered a firm resistance to the counts of Holland, and were finally amalgamated with the empire of Charles V. The Frisians between the Ems and the Jade became subject to the counts of Oldenburg in 1284, after the battle of Alteresch. Those between the Jade and the Weser retained their independence much longer, but were subjugated by Oldenburg in 1514, with the aid of Brunswick-Lüneburg.—The small remnant of Frisians who still adhere to their ancient peculiarities and dialects are divided into three branches. The West Frisians inhabit the eastern coast land of Holland; the East Frisians live in the fens and morasses of Saterland and on the island of Wangeroog; the North Frisians occupy the western shore of Schleswig, and the adjacent islands of Sylt, Föhr, Amrum, and Helgoland. There is a wide difference among the dialects of these three branches; each village, in fact, has its own way of speaking. The North Frisian alone has ten distinct dialects, and an inhabitant of the island of Föhr is with difficulty understood by the Frisians on the mainland. The Frisian dialects are most closely related to Anglo-Saxon. Several Danish linguists maintain that the North Frisian dialect was transitional to the Norse language, and, mixing with Anglo-Saxon, became the parent of Danish. According to legends current among them, the North Frisians dwelt in Jutland at a time when the continent extended as far as Helgoland and the other islands. Their dialect is considered purest as spoken by the inhabitants of the Schleswig coast. As it is not used for literary purposes, it does not possess a strict grammatical structure. The definite article in

the singular is either *dé*, *jô*, or *dât*, according to the gender of the noun (masculine, feminine, or neuter), and in the plural always *dá*; the indefinite article is *án*, *en*, or *n*. Personal pronouns are: *ick*, I; *dô*, thou; *he*, he; *jô*, she; *dât*, it; *we*, we; *wát*, we two; *ját*, you two; *jám*, you; *já*, they; *niemmen*, nobody; *hüm*, who, some one; *sônân*, *sônijn*, such a one. Possessive pronouns are: *mán*, *dán*, *sán*, *hárren*, *sán*, *úhsen*, *unken*, *junken*, *járringe*, *járe*, for my, thy, his, her, &c., in the masculine singular; and *mín*, *dín*, *sín*, *hárre*, *sín*, *úhs*, *unk*, *junk*, *járringe*, *járe*, for the feminine and neuter genders in the singular, and for the three genders in the plural. Possessive pronouns agree in number and gender with the thing possessed. Nouns in the possessive case take an *s*. The following is the conjugation of a regular verb: Present, *ick rôgt*, *dô rôgtet*, *he, jó, hát, dât rôgtet*, I judge, &c.; *wát, já, we, jám, já rôgete*, we judge, &c.; past, *ick rôgtet*, *dô rôgtetet*, *he rôgtet*, I judged, &c.; *wát, já, we, jám, já rôgteten*, we judged, &c. The past participle is formed by changing the termination *n* of the infinitive into *t*, as *rôgten*, to judge; *rôgtet*, judged. The compound tenses are formed as in English. Auxiliary verbs are *worden*, to be or to become; *wêsen*, to be; and *hêwen*, to have. They are joined to the past participle as follows: *ick hâw rôgtet*, I have judged; *ick word rôgtet hâjd*, *hêwen*, I shall have (had) judged; *ick hâ rôgtet hâjd*, I had (had) judged, &c. The present participles terminate in *end*. The syntax of the North Frisian language (*nordfríske Sprâjke*) and its points of similarity with English may be gathered from the following example:

Jâm shân át etle, noch Yaage, untig fêlsh honds d Ihne má de Auwers.

You shall not steal, nor lie, nor falsely deal the one with the other.

In the literature of the old Frisian are some of the most ancient sources of Germanic jurisprudence, as the *Senarjucht* ("Ecclesiastical Law"), edited by Winshem (Franeker, 1622); *Ost-Fries-Landrecht*, by Wicht (Aurich, 1746); *Hunsinger Landrecht* of 1252 (Groningen, 1778); *Fivelinguer und Oldamater Landrecht*, by Wiarda (1784); and *Emsinger Landrecht* of 1312 (Hanover, 1824). Literary specimens of several North Frisian dialects are to be found in Hansen, *Nahrung für Leselust in nordfrisischer Sprache* (Sonderburg, 1833 et seq.); Hettema, *Frieske, Hilgelaonner en Nord-frieske Rymkes, samme trog* (Dokkum, 1841); and Nissen, *De freiske Siemstin*, in course of publication (1874). Trustworthy works on the language are: I. ynghy, *Om Nordfrisisk i Bökkingog Hoidding Herreder* (Copenhagen and Leipsic, 1858), and Bendsen, *Die nordfrisische Sprache nach der moringer Mundart* (Leyden, 1860). Consult also the articles on the language published by Clement in the recent volumes of Herrig's *Archiv für das Studium der neueren Sprachen und Literaturen*, and by Strauss in *Neues Jahrbuch der*

berlinischen Gesellschaft für deutsche Sprache und Alterthumskunde.

FRITH, William Powell, an English artist, born at Studley, near Ripon, Yorkshire, in 1819. He is one of the most successful painters of *genre* of the modern English school, selecting his subjects from Shakespeare, Cervantes, Goldsmith, the "Spectator," and kindred sources. Of late years he has produced some striking representations of every-day life. Perhaps his greatest painting is the "Railway Station" (1862), for which he received £6,000; the painting, with the right of engraving, has since been sold for £23,000. He was elected an honorary member of the imperial academy of fine arts at Vienna in 1869, and of the royal academy of Belgium in 1871.

FRITZ, Samuel, a German Roman Catholic missionary, born in Bohemia in 1650, died in Jeberos, Ecuador, in 1730. Being sent as a missionary to the Omagua Indians of South America, he selected as his field of labor the district between the mouths of the Rio Napo and the Rio Negro on the upper Amazon, where in 1688 he had succeeded in attaching five other tribes to the Omaguas, among whom he had established 40 missions. The whole number of Indians to whom the gospel was thus preached was about 40,000. In 1710 the war of the Spanish succession which was occupying Europe seemed to the Portuguese of Pará sufficient reason for making an irruption into the country of the upper Amazon, and of the Indians in the district of Father Fritz more than 20,000 were carried captive to Pará, and most of the others fled to their native forests. Fritz made a large map of the river Amazon, which long maintained its authority.

FRIULI (Ger. *Friaul*; so named from the ancient town of *Forum Julii*, now *Cividale del Friuli*), an old province of N. Italy, formerly embracing some adjoining districts and divided between Austria and the republic of Venice, and afterward, under the dominion of Austria, forming the circle of Görz, part of Trieste, and the delegation of Friuli or Udine in Venetia. It was one of the most important duchies of the Lombard kingdom, and after the overthrow of that monarchy by Charlemagne, and even up to the 15th century, when it was conquered by Venice and its territories were dismembered, it retained a considerable degree of independence. The main or Venetian portion was ceded to Austria in 1797, was annexed to the kingdom of Italy in 1806, recovered by Austria in 1814, and in 1866 united to the kingdom of Italy, and is now called the province of Udine. (See UDINE.) The Friulians are a tribe kindred to the Italians, but their language is largely mixed with Celtic elements.

FRÖBEL. See FROEBEL.

FROBISHER, Sir Martin, an English explorer, born near Doncaster, died in Plymouth, Nov. 7, 1594. After spending 15 years in fruitless endeavors to get up an expedition to find the northwest passage, he at length sailed with

three barks from Deptford, June 8, 1576, going as far as Labrador and Greenland, discovering the bay now known by his name, and returning in October. Indications of gold were discovered, which led to the despatch of a large squadron in the following year; and the ore brought back being thought valuable, still a third expedition was fitted out with 15 ships in 1578, but the fleet, being scattered by storms on the coast of Greenland, was obliged to return early in the winter without having effected any settlement. Relics of these expeditions were discovered by Hall in 1860-'62. In 1585 Frobisher went with Sir Francis Drake to the West Indies; and in 1588, on the defeat of the Spanish armada, he was knighted for his services in the action. He afterward commanded a fleet on the Spanish coast, and in 1594 supported Henry IV. against the leaguers and Spaniards, and died of a wound received in an attack on Brest.

FROBISHER BAY, an arm of the sea in British North America, setting up westward from the Atlantic near the entrance to Davis strait, between Hudson strait and Northumberland inlet. It penetrates the region known as Meta Incognita, is 240 m. long, 30 m. in average breadth, and has rugged mountainous shores.

FROEBEL. I. Friedrich, a German educator, founder of the *Kindergarten* system of schools, born at Oberweissbach, April 21, 1782, died in Marienthal, June 21, 1852. In 1826 he published the first volume of his work on education (*Die Menschenenerziehung*). In this, as well as in a weekly journal which he edited subsequently (*Wochenschrift für alle Freunde der Menschenbildung*), he advocated a full and harmonious development of the human faculties. In 1837 he founded a school or *Kindergarten* for little children at Blankenburg, Thuringia, which became the model of similar institutions in many parts of Germany and in foreign countries, especially in Switzerland. The duke of Meiningen gave him the use of his mansion of Marienthal, near Liebenstein, for the establishment of a normal school, where female teachers were instructed. The great freedom which he allowed to the children was considered dangerous, and his schools were denounced as nurseries of socialism and atheism. His nephew, Karl Froebel (born in 1808), had founded a school for girls at Hamburg in 1850, the programme for which furnished a pretext to the Prussian government for prohibiting (Aug. 7, 1851) all *Kindergärten* in which the Froebel system of education prevailed. **II. Julius**, a German author and traveller, nephew of the preceding, born in Griesheim in 1806. He engaged successively in various scientific, literary, and statistical labors, and attended the universities of Jena, Munich, and Berlin. In 1833 he was appointed professor of geography, natural history, and history at Zürich, and was subsequently professor of mineralogy in the high school of that city. Having become a natu-

ralized citizen of Switzerland, he joined the extreme radical party, and edited the "Swiss Republican." He also founded a publishing house, and in 1844 relinquished his professorship. He issued several scientific works and political pamphlets; but many of them were suppressed in Germany. Having returned to Germany, he was expelled from the Prussian territory, and went to Dresden. In 1848 he became a popular leader of the democratic party and a member of the German parliament at Frankfort. Accompanying Robert Blum to Vienna, he was arrested, and sentenced to death by the same court martial which sentenced Blum, but was pardoned. On the dissolution of the parliament he repaired to Switzerland, and afterward to the United States. He was editor of a German newspaper, and lectured in New York, went in 1850 to Nicaragua, and afterward to Santa Fé and Chihuahua. During this period he was a frequent correspondent of the "New York Tribune." In 1855 he edited a journal at San Francisco. In 1857, after his return to Germany, attempts were made to expel him from Frankfort, the American consul protesting upon the ground that he had become a naturalized citizen of the United States. After residing some time in London, he went to Vienna in 1862 to become editor of the journal representing the liberal cabinet then in power. From this time he again took an active part in German politics as one of the leaders of the *Gross-Deutsche* or federalistic party. After the fall of the cabinet he went to Stuttgart, and in 1867 to Munich, where he established the *Süddeutsche Post*. Among his works are: *System der sozialen Politik* (2 vols., Mannheim, 1847); *Die Republikaner*, a historical drama (Leipsic, 1848); *Aus Amerika, Erfahrungen, Reisen und Studien* (2 vols., Leipsic, 1858; English translation, "Seven Years' Travel in Central America, Northern Mexico, and the Far West of the United States," London, 1859); *Theorie der Politik* (2 vols., Vienna, 1861); *Kleine politische Schriften* (2 vols., Stuttgart, 1866); and *Die Wirthschaft des Menschengeschlechts auf dem Standpunkte der Einheit idealer und realer Interessen* (Leipsic, 1870). In 1873 he was appointed consul of the German empire at Smyrna, Asia Minor.

FROG, a batrachian reptile of the anourous or tailless order, embracing the group *phaneroglosses* (Dum. and Bib.), with the families *ranidae* or common frogs, and *hylade* or tree frogs. The general characters of the class and of the order have been sufficiently given in the article *ΑΜΦΙΒΙΑ*, so that the principal families, genera, and species will only be mentioned here. The family of frogs or *ranidae* include those genera the free extremities of whose fingers and toes are not dilated into disks, and whose upper jaw is provided with teeth; among these are many whose thick and clumsy bodies resemble those of toads (*bufonidae*) rather than of frogs; in addition to maxillary teeth, most

have also teeth on the palate and vomer, whose groupings, together with the form of the tongue and the visibility of the tympanum, are characters distinctive of genera and species. Almost all have, in the males, the vocal vesicles in the throat, communicating with the mouth, by the entrance of air into which their remarkable and loud sounds are produced; the nostrils open laterally, near the end of the snout; they have four non-palmated fingers, with the rudiment of a thumb, and five webbed toes; the back is generally irregularly roughened by glandular and other eminences, while the under surface is smooth. Frogs pass most of their time in the water, being excellent swimmers; the length of their hind limbs enables them to make considerable leaps, and to travel over land in this way long distances in search of water; they are unable to climb trees, like the family *hylade* or tree frogs. Some species prefer moist localities and damp woods, where they hide in the grass and under leaves; others dwell in subterranean hollows which they dig on the borders of marshes, coming forth at evening or on rainy days. All the species when adult are decidedly carnivorous, even the smaller eating mollusks, insects, and worms, and all are characterized by great voracity. The frog family is found throughout the globe, though most abundantly in America; indeed five of the eight genera admitted by Duméril and Bibron are peculiar to the new world; after America come Asia, Europe, Africa, and Polynesia, in the order of abundance of species. Of the numerous genera described, the genus *rana* (Linn.), which includes the common frogs, is the best known and the most interesting. The principal characters of the skeleton of the frog are the small number of vertebrae, the absence of true ribs, the development of the transverse processes of the sacrum, the mobility of the iliac bones, the length of the coccyx, the presence of occipital condyles and an arch of scapular bones constituting a shoulder, and the elongation of the bones of the lower extremities. The muscles of the thigh and leg resemble considerably those of man and mammals. When a frog is at rest, the articulations of the pelvis, thigh, leg, and foot form four great folds or levers, by the sudden opening of which at the same time its remarkable leaps are effected; the swimming of the frog, which has erroneously been taken as a model for man in this respect, consists in a series of horizontal leaps, the body being sustained by the water, and its general form offering little resistance, and the anterior limbs being folded against the trunk instead of acting as aids to the legs in locomotion; walking of course must be difficult and slow where there is such disparity in the length of the arms and legs. The skin is smooth, made up of the usual layers, and in many parts of the body separated from the muscles to such an extent that it may be considerably distended at the will of the animal; the thin epidermis is frequently renewed; in the pigment layer

are seated various colors, especially bright in the season of fecundation. The sense of smell is very imperfect; the tongue is not an organ of taste but of prehension, soft and covered with a viscid mucus, its base attached to the concavity of the lower jaw, its bifurcated point extending backward, and the whole organ capable of being projected from the mouth in a reversed position for the seizure of its insect prey; the organ of hearing has a tympanum, and an aerial cavity under it communicating with the throat. The mouth is very widely cleft, and some of the larger species have been known to swallow small mammals and birds; like other amphibians they cannot drink. The structure of the heart, gills, and lungs, and the phenomena of the circulation in the tadpole and adult, and of the branchial, pulmonary, and cutaneous respirations, have been described in the article AMPHIBIA. The well known voice of the frog varies so much in intensity and tone as to render it difficult from the sound to ascertain the distance of the animal, far surpassing in this respect the efforts of the most skilful ventriloquist; it can make a dull sound even under water. Among the many authors who have attempted to imitate in words the sounds of the frog, one of the most successful is Aristophanes, in whose comedy of the "Frogs" a frequent verse in the chorus is *brekekekex koax koax*, whose night-long repetition in spring and summer sometimes renders sleep impossible to those unaccustomed to it. By their power of retarding or accelerating the respiratory movements, and of aerating the blood through the vessels distributed to the skin, frogs are able to resist considerable changes of cold and heat, and to sustain life during their winter torpidity; the absorption and exhalation performed through the skin explain their occurrence and prolonged existence under circumstances where ordinary animals would soon perish, as under water and in air-tight places. The sexes are separate, and the reproductive functions are performed in the same mechanical and passionless manner as in most fishes; the ova are fecundated at the moment of their exclusion. As the eggs are expelled they are enveloped in a glairy mass, in which the embryos are seen distributed like black dots; the development is very rapid under favorable circumstances of temperature, the head and tail becoming perceptible in the course of the second day, the gills on the third, and the tadpole at the temperature of 80° F. (as in Rusconi's experiments) may leave the egg on the fourth or fifth day; but in the ordinary seasons of temperate Europe and America, the young are not hatched until about a month after the deposit of the eggs. The tadpole is half an inch long when hatched; the mouth is distinct, but small and without lips; the gills rapidly enlarge, and when at their maximum development afford beautiful objects for displaying the circulation; the gills soon begin to decrease in size, and are finally withdrawn within the branchial cavity,

as in fishes, and concealed by an opercular fold of integument; the eyes are perfectly formed; the mouth acquires movable lips, is placed nearer the end of the head, and is used for the introduction of vegetable food; the caudal fin increases in size, and serves for rapid locomotion. Without any great change in form, the size is rapidly increased; two small tubercles appear near the vent, the rudiments of the posterior legs, which are soon developed into the perfect limbs; the anterior limbs are afterward formed under the skin in a similar manner; as the legs are perfected the tail is gradually absorbed from the tip to the base, and progression is effected by the hind limbs. The lungs are now fitted for the respiration of air, and the little creatures come on land in search of worms and insects,



Eight stages of development of the tadpole, from the recently hatched (1) to the adult form (5), as illustrated by St. George Mivart.

and in such multitudes in damp weather as to give rise to the belief, still popularly adhered to in many places, that it has rained frogs. They grow rapidly during the summer and autumn, and in winter plunge into the mud to pass their stage of hibernation. In the tadpole state great numbers are devoured by fishes, other reptiles, and by each other; and the adults furnish food for all classes of vertebrata from fishes up to man himself. It is probable that not more than one in a thousand of those which come from the egg in the spring live to reach their winter retreat; if fortunate enough to escape from all enemies, frogs may live many years. Serpents among reptiles, pickerel among fishes, vultures, storks, herons, and cranes among birds, are the worst enemies of frogs; were it

not for the storks of Egypt, that country would be overrun with frogs. When it is remembered that each female frog of the hundreds in a single locality may produce 1,000 young, which hide in crevices in the earth and under stones, ready to come forth to enjoy the genial summer showers, there is no necessity for any attempt to explain the appearance of the frog multitudes by supposing them to have fallen from the clouds, as has been believed even from the time of Aristotle, or by the supposition that they have been taken up from some marsh by a whirlwind and let fall during a rain; the latter occurrence, on a small scale, is not impossible, in exceptional cases. The frogs which thus appear bear marks of their recent metamorphosis, in the remnant of a tail and other organs; crawling as they naturally would into the ground, the swelling of the earth from rain would drive them out by compression. From facts recorded in the "Annals and Magazine of Natural History" (1858, pp. 341 and 482), it would seem that frogs and toads may be reproduced without passing through the intermediate stage of tadpole; it is only of late years that many common fishes have been ascertained to be viviparous, and it is not improbable that eggs laid in localities where water cannot be obtained, as in cellars and hot houses and beds, may produce frogs, whose larval form is very soon exchanged for the perfect state, the gills being prematurely cast to enable the animal to accommodate itself to its new circumstances; and it may be, as Mr. Jenyns remarks, that the frogs are hatched on land in the perfect state, the gills either never having existed or having disappeared immediately after birth. On the other hand, it has been ascertained that the larval or tadpole state may be unnaturally prolonged; Prof. J. Wyman (in the "Proceedings of the American Academy of Arts and Sciences," vol. iii., p. 35) experimented on the tadpoles of the common bullfrog, the greater number of which pass the winter without having undergone metamorphosis, not becoming perfect animals until the following spring; he found that the tadpole state, by the influence of darkness and low temperature, could be prolonged certainly from one to two years, and probably much longer; possibly some of the cases referred to by Mr. Jenyns and others may admit of explanation by prolongation rather than an absence of the larval condition, the young frogs having been the result of tadpoles which had passed their larval condition in some other locality, or in the same in a torpid state for a year.—The tenacity of life in frogs is very great; they survive the severest wounds, live a long time after the heart and entrails are removed, and display muscular contractility and the phenomena of circulation in various organs for many minutes and even hours after death has actually taken place. On this account the frog has from time immemorial been selected as a subject of experiment to ascertain and illustrate the most important phenomena of human physiology, and has in this way been of ines-

timable advantage to mankind. The change of a fish-like animal, breathing by means of gills in water, to a leaping, air-breathing creature, with the corresponding modifications of food and habits, is well calculated to excite the admiration of a thinking person. The air cells of the frog's lungs, the membrane of its foot, and the delicate fringe of the tadpole's gills, afford admirable and easily obtained tissues for demonstrating under the microscope the circulation in the capillary vessels, with their chains of moving blood globules. The structure of the lungs and the mechanism of their respiration furnished to anatomists and physiologists proof of the changes which the blood undergoes under the influence of the oxygen of the air through the medium of a thin intervening vascular wall. The sensibility of their muscles to the galvanic currents led Galvani and Volta to most important discoveries in electricity and galvanism, whence flowed the great results obtained by Bell, Faraday, and Matteucci in the physiology of the nervous system, and by Davy and others in physics and the chemical constitution of bodies previously supposed simple. The phenomena of cutaneous absorption, exhalation, and respiration have derived their fullest illustration and explanation from experiments made on the soft and naked skin of the frog. Thus this despised creature has rendered the greatest services to anatomy, physiology, physics, and chemistry, and has thrown light which no other animal could on the functions of innervation, muscular contractility, circulation, respiration, absorption, and generation. The frog is not only a graceful and harmless animal, but is actually useful in destroying insects and slugs injurious to vegetation. Though in England and the United States frogs are rarely eaten by man, in France and southern Europe they are largely consumed as food; they are caught in various ways, and are preserved in large "froggeries" until wanted for the table; the flesh is most delicate and nutritious at the time when they are about to enter their winter quarters, yet great numbers are eaten in the spring, when they are more easily caught; the hind limbs are generally the only part eaten, and these are cooked in various modes, in all of which they are as much more delicate than chicken as that is superior to veal and pork. In the *materia medica* the flesh of frogs has long been used by continental physicians as the basis for anti-scorbutic and restorative broths.—The largest species of the genus *rana* in the United States is the bullfrog (*R. pipiens*, Latr.), which often measures when extended 18 or 21 in.; the general color above is green in front, dusky olive behind, with irregular black blotches, and below yellowish white, with dusky marks; the limbs dusky, with black bars. The bullfrog, so called from its loud voice, is rather solitary in its habits, living about stagnant and sluggish water, not very abundant in one place except during the breeding season; it is the most aquatic of the frogs, and an excellent swimmer, often living

for years in wells, where it is allowed to remain under the supposition that it purifies the water; it is also an active leaper, taking to the water when alarmed. Its voracity is extreme; it devours young ducks, snakes, moles, mice, insects, worms, snails, its own tadpoles, and

ginia, on the borders of marshes and pools, and sometimes at a great distance from water; it has a peculiar strong and disagreeable odor; from its being a favorite bait for pike, it is often called the pickerel frog. The shad frog (*R. halecina*, Kalm) is one of the handsomest

1. Bullfrog (*Rana pipiens*).
2. Northern Bullfrog (*Rana Horiconensis*).

any small animal it can catch; it does not seize prey unless alive or in motion. The species is very generally distributed over the United States. The spring frog (*R. fontinalis*, Le Conte) is green above, with dusky spots behind; throat and abdomen yellow; hind limbs dark green, with dusky bars; a cutaneous fold or ridge from the orbit to the hind legs; the total length is about 8½ in.; it is fond of springs of cold water, and feeds on worms and insects; it is common from Maine to Virginia. The marsh frog (*R. palustris*, Le Conte) is pale

1. Wood Frog (*Rana sylvatica*).
2. Spring Frog (*Rana fontinalis*).

species, being green above, with ovate spots of dark brown margined with yellow, and yellowish white beneath; it is about 8½ in. in total length, active, and able to leap a distance of 8 to 10 ft. when alarmed; it is called shad frog from its appearing in the middle states in the spring with this fish; it is also called water and leopard frog; it is very widely distributed in the United States, and is the nearest representative here of the common frog of Europe, being like that sought

1. Shad Frog (*Rana halecina*).
2. Marsh Frog (*Rana palustris*).

brown above, with two longitudinal rows of dark brown square spots on the back and sides, yellowish white below, with the posterior half of the thighs bright yellow mottled with black; it is slender and delicately formed, about 8 in. in total length; it is found from Maine to Vir-

- Common Frog (*Rana temporaria*).

after by epicures. The wood frog (*R. sylvatica*, Le Conte) is pale reddish brown above, and yellowish white below; the head has a dark brown stripe extending from the snout to the tympanum through the eye; the total length is a little over 5½ in.; it is found from

Michigan to the Carolinas, chiefly in thick woods, preferring those of oak; it is active, when pursued hiding itself under leaves; it rarely approaches water except in the breeding season. The crying frog (*R. clamitans*, Bosc.), a slender species, is olive-colored in front, dusky behind, and silvery white below; the total length is 8½ in.; it is very active, and when leaping frightened into the water utters a short loud cry; it is a southern species, taking the place of the spring frog of the north, and by some thought to be the same.—Like all other reptiles, the common frog of Europe (*R. temporaria*, Linn.) differs from all American species; the color is generally brown, inclining to reddish or yellowish above, with irregular spots of black or brown, and transverse bands on the legs, and yellowish white below with smaller and fewer spots; the most constant mark is an elongated brown patch behind the eye on each side; the total length is about 7 in.; it is found very generally over Europe. The green frog of Europe (*R. esculenta*, Linn.) is of a general greenish color above, with black or brownish marks, and sometimes with three

Green Frog (*Rana esculenta*).

yellow stripes on the back, and yellowish white below; the total length is about 8 in.; it is distributed over Europe, Asia, and northern Africa, and is the species most sought after for food.—There are several species of small frogs, principally American and subtropical, belonging to the genus *cystignathus* (Wagler), characterized by the almost entire absence of webs to the toes; for their description the reader is referred to the work of Dr. Holbrook (vol. i.), and of Duméril and Bibron (vol. viii.). The genus *ceratophrys* (Boie) or *phrynosceros* (Tschudi) will be described under HORNED FROG; the tree frogs (*hyla*, Laurenti) and the peeping frogs (*hylodes*, Fitz.) will be noticed under TREE FROG, belonging as they do to the family *Aylidae*.—The frogs are considered by Agassiz lower than the toads among anurous batrachians, on account of their aquatic habits, the persistence of the embryonic webs between the toes, and the non-existence of glands developed in the substance of the skin. The family *ranidae* are the most numerously represented of the fossil anurous batrachians, and their remains occur in the tertiary and diluvian formations, sometimes of large size. The gigantic

cheirotherium or *labyrinthodon* is placed by Jäger, Fitzinger, and Owen among batrachians; this immense frog-like animal, with a head 2 or 3 ft. long and the body 10 or 12, first appeared in the carboniferous period, was abundant in the triassic, and probably disappeared before the Jurassic epoch. From the facts now ascertained it would appear that the muddy shores and flats of remote geological ages were inhabited by batrachoid forms as strange as the flying pterodactyl or the great *ichthyosaurus* and *plesiosaurus*, and that possibly frogs 12 ft. long (like *cheirotherium*) leaped and croaked in the ancient marshes.

FROISSART, Jehan, or **Jean**, a French chronicler, born in Valenciennes in 1337, died at Chimay about 1410. His father, a heraldic painter, destined him to the clerical profession. He was scarcely 20 years old when, upon the invitation of Robert of Namur, he undertook to write a history of the wars and adventures of his times. He compiled from the *Vraies chroniques* of Jehan le Bel, canon of St. Lambert in Liège, the first part of his own "Chronicles," embracing the period from 1226 to 1340. When this was completed he went to England in 1360, and presented it to Philippa of Hainaut, the queen of Edward III. In 1362 he was made clerk of her chapel (having already taken holy orders), and also her secretary. In 1364 he visited Scotland, where he was kindly treated by King David Bruce, and enjoyed the hospitality of the Douglases. After gathering ample materials in Great Britain, he returned to the continent, and in 1366 went to the English court at Bordeaux. Thence he returned for a short time to England, and in 1368 we find him accompanying Lionel, duke of Clarence, to Italy, and, with Chaucer and Petrarch, witnessing in Milan the celebration of the marriage of that prince with the daughter of Galeazzo Visconti. In 1369 he repaired to his native country, where he obtained the living of Lestines. But the life of a country priest did not suit him, and he attached himself to Wenceslas of Luxemburg, duke of Brabant, who intrusted him with the care of collecting and writing down his rondeaux, ballads, songs, and virolays. To these Froissart added some of his own compositions, and the collection formed a volume with the title of *Melyador*, or "The Knight of the Golden Sun." But Wenceslas died before the work was completed, and Guy, count of Blois, made Froissart clerk of his chapel, and sent him with a letter of introduction and gifts to Gaston Phœbus, count of Foix. After sojourning a long while at Orthez he accompanied this prince's niece, Jeanne de Boulogne, when she went to Riom to marry the duke of Berry. Thence he repaired to Paris, and afterward travelled again through Holland, Languedoc, and other countries. In 1390 he settled at Chimay, having been appointed canon and treasurer to the church there, and, with the exception of the time spent in a visit to England for the purpose of

presenting Richard II. with a collection of his poems, he there devoted his later years to the completion of his great work. His book is a living picture of his age. An admirer of heroic deeds, an instinctive courtier of every prince or lord, delighted with feasts and pageants, he vividly depicts all that interests him, and gives more prominence to individual exploits than to important events. He is devoid of patriotism, and shows no partiality to the French, narrating their defeats with as much gusto as their victories; he has no philosophical views nor political opinions; but he is incontrovertibly the most amusing and vivacious of chroniclers. He also wrote more than 30,000 verses, a few specimens of which have been occasionally published; but his fame rests exclusively upon his historical work. The finest copy of Froissart's chronicle is at Breslau; it comprises four volumes, most carefully written, and embellished with magnificent vignettes. The chronicle embraces the annals of the 14th century from 1326 to 1400, and was printed for the first time about 1498 at Paris by Antoine Vérard (4 vols. fol.), under the title of *Chroniques de France, d'Angleterre, d'Ecosse, d'Espagne, de Bretagne, de Gascogne, Flandres et lieux d'alentour*. The reprints of 1514, 1518, and 1580 contain continuations to the year 1518 by unknown authors. The chronicle was translated into English by order of Henry VIII. and published under the title of "Chronicles of England" (2 vols. fol., London, 1528-'5). The English versions are generally preferred on account of their retaining the original spelling of the proper names. The best French edition is by Buchon (15 vols. 8vo, Paris, 1824), reprinted with important additions and improvements in the *Panthéon littéraire*, under the title of *Les chroniques de sire Jean Froissart, qui traitent des merveillesuses entreprises, nobles aventures et faits d'armes advenus en son temps en France, Angleterre, Bretagne, Bourgogne, Ecosse, Espagne, Portugal, et es autres, nouvellement revues et augmentées d'après les manuscrits, avec notes, éclaircissements, tables, et glossaire* (3 large vols. 8vo, Paris, 1835-'6). A volume of extracts, containing the most interesting parts, was published in 1846. Sir Walter Scott was of opinion that for artlessness and vivacity of style the old version is to be preferred to the more exact and learned translation made by Thomas Johnes, under the title of "Sir John Froissart's Chronicles of England, France, and the adjoining Countries" (4 vols. 4to, Hafod press, 1803-'5). To the second edition of Johnes's translation (12 vols. 8vo, London, 1805) are prefixed a life of the author, an essay on his works, a criticism on his history, and a dissertation on his poetry. Another edition has been published by Henry Bohn (2 vols. 8vo, London, 1845).

FROME, a town and parliamentary borough of Somersetshire, England, 19 m. S. E. of Bristol; pop. in 1871, 11,846. It is pleasantly situated on an affluent of the Avon. The parish

church, an ancient Gothic building, has a tower and spire 150 ft. high, and there are four new churches, of which St. Mary the Virgin, opened in 1864, is the finest. Schools and charitable institutions abound, and there are a literary and mechanics' institute and a church institute with library and reading rooms; a fine building for a museum and library was opened in 1867. There are extensive breweries, and manufactories of woollens, silks, hats, and carriage linings.

FROMENTIN, Eugène, a French painter and author, born in La Rochelle in December, 1820, died Aug. 27, 1876. He studied under Cabat, and exhibited in 1847 excellent pictures of Algerian scenery and public buildings. He was sent in 1852 on an archæological mission to Algeria by the committee of historical monuments. After his return to Paris he produced many landscapes and genre pictures relating to Arab life and scenery, remarkable for their brilliant coloring and their delicacy of execution. His "Chase of Gazelles" was purchased by the government, as well as his "Falcon Chase" and "Arabian Falconer," which latter are in the Luxembourg. He published *Visites artistiques* (1852), *Simplex pèlerinages* (1856), *Une année dans le Sahel* (1858), and a successful novel, *Dominique* (1863).

FRONDE, a political faction in France which headed an insurrectionary movement during the latter part of the minority of Louis XIV. The name of *frondeurs*, which means literally slingers, was applied to its members in derision; in their sneering and flippant attacks upon Cardinal Mazarin they were said to resemble boys throwing stones from slings. But the name, though given in derision, was soon accepted by those to whom it was applied. The long and powerful rule of Richelieu had completed the work of centralizing all the power of France in the hands of the royal government, and finally broken the might of the independent families in the kingdom. The spirit of opposition, which was crushed in its last conspiracies, revived under his feeble successor, Mazarin, who was hated by the nobles as a foreigner and friend of foreigners, and by the people for his extortions. The movement assumed a warlike aspect in 1648, when Mazarin declared the decrees of parliament, which had acted as an independent political body, to be attempts upon the rights of the crown, and arrested the president and one of the members. The next day the people of Paris rose in arms, dispersed the Swiss guards, and erected barricades in the streets adjoining the royal palace. The frightened court repealed the recently imposed taxes and promised a better administration of justice. This still more encouraged the *frondeurs* of the parliament, whose continued opposition finally compelled the court to retire to St. Germain (Jan. 6, 1649). Paris was now in the hands of the insurgents, and Prince Louis Condé at the head of 7,000 men undertook to besiege it. The parliament

called the people of the city to arms; the prince of Conti, the dukes of Longueville, Beaufort, Orleans, Bouillon, Elbeuf, Vendôme, and Nemours, the marshal de la Mothe, and the popular De Retz, came forward as their leaders; spirited and beautiful ladies, among whom the duchess de Longueville was the most conspicuous, inspired their courage; and foreign aid was expected from the Netherlands. But the leaders of the movement, having it in their power to change it into a complete revolution like that which had just been achieved in England, became afraid of the consequences of their own victory, and hastened to conclude (March 11) a treaty with the court at Ruel. The subsequent phases of the Fronde were composed of intrigues and contentions for power between the princes of the blood and the cardinal-minister. After the return of the court to the capital (Aug. 18), Mazarin again used violence, and had Longueville and the princes of Condé and Conti arrested (Jan. 18, 1650). This caused risings in the provinces, and Marshal Turenne hastened to the rescue of the princes; but after several advantages he was routed in the engagement of Rethel (Dec. 15). The triumphant minister could not long enjoy his success; the united opposition of all parties compelled Queen Anne to release the princes, and to sacrifice Mazarin, who withdrew to Cologne (February, 1651). Anne recalled her minister when the leaders of the insurrection, Condé and Conti, were quarrelling, and Condé fled, repaired to Bordeaux, armed his numerous adherents, and marched toward the capital; but Turenne now commanded against him, and Condé would have been routed near Paris (July 2, 1652) if the gates of the city had not been thrown open to him. Paris, however, tired of commotions, treated with the court, which had withdrawn, and Louis promised an amnesty and the dismissal of the hated minister. Condé, having received a reinforcement of 12,000 men from Lorraine, rejected the propositions, and marched into Champagne; but finding no adherents, he went over to the Spaniards in the Netherlands. Louis XIV., having returned to his capital (Oct. 21), proscribed Condé, and forbade all political action on the part of the parliament. Mazarin also returned triumphantly (Feb. 8, 1653) to his post. Many who had distinguished themselves in the parliament or under Condé were temporarily banished, and the movement in the provinces soon subsided. It is noteworthy that a number of women were the leading spirits of this faction, and that everything was done with unparalleled frivolity, which gave to the whole war rather a ridiculous aspect. Count Saint-Aulaire undertakes in his *Histoire de la Fronde* (2 vols., Paris, 1841) to present it as a genuine attempt at obtaining a constitutional monarchy. See also Barante, *Le parlement et la Fronde* (1859), and "The Great Condé and the Period of the Fronde," by Walter Fitzpatrick (2 vols., London, 1878).

FRONTENAC, an E. county of Ontario, Canada, bounded S. by the St. Lawrence river, near its head in Lake Ontario; area, 328 sq. m.; pop. in 1871, 28,717. It contains many small lakes, and is traversed by the Grand Trunk and the Kingston and Pembroke railways, and by the Rideau canal. Capital, Kingston.

FRONTENAC, *Louis de Buade*, count de, a French governor of Canada, born about 1620, died in Quebec in November, 1698. He entered the army at the age of 17, served in Italy, Flanders, and Germany, and in 1669 in Candia. He was appointed governor general of Canada by Louis XIV., and arrived in September, 1672. He was a man of ability and courage, active and full of resource, but apt to be arbitrary and prejudiced. One of his first steps was to build Fort Cataracoui or Frontenac on Lake Ontario, to keep the Iroquois in check. He sent Marquette and Joliet to explore the Mississippi, and was the constant patron of La Salle; but he became involved with the intendant Duchesneau, and with the ecclesiastical authorities, who opposed the liquor trade among the Indians. He was accordingly recalled in 1682; but when Canada had been brought to the verge of ruin under the administrations of De la Barre and Denonville, Frontenac was again sent out in 1689. He took part in the proposed expedition against New England and New York, and set to work with energy to carry the war into the British colonies, attacking them at Hudson bay and by series of war parties, carrying Fort Pemaquid in Maine, Schenectady, Salmon Falls, Casco, and other frontier towns and posts. He completed his vigorous campaign by the repulse of the land and naval force under Sir William Phips before Quebec in 1690. He afterward sent a force into the Mohawk territory and humbled that tribe, restored Fort Frontenac, which had been abandoned and destroyed, and again revived the French influence among the Indian tribes. As this failed to bring the cantons to peace, he led an army in person in 1696 to the heart of New York, laying waste Onondaga and Oneida. Iberville at the same time reconquered most of Newfoundland, and then sailing to Hudson bay defeated an English fleet and reduced the English posts. Having thus restored the fallen fortunes of France in America, Frontenac died soon after, and was buried in the church of the Recollect fathers, to whom he was greatly attached. On the destruction of the church his body was removed to the cathedral of Quebec in 1796. His wife, a daughter of Lagrange Trianon, was one of the famous beauties of the court, and seems to have entertained a strong dislike to her husband, being reported to have used her influence to secure his reappointment to get him out of France. She died in 1707. Parkman devotes a volume of his "History of the French Dominion in America" to a full account of the career of Count Frontenac.

FRONTIER, a S. W. county of Nebraska, formed since the census of 1870, drained by affluents of Frenchman's fork of the Republican river; area, about 675 sq. m.

FROSINONE (anc. *Frusino*), a town of Italy, formerly capital of a papal legation of the same name, now in the province and 48 m. E. S. E. of the city of Rome; pop. about 8,000. It contains several churches and convents and an episcopal palace; and near it are remains of a Roman amphitheatre. It is a favorite resort for artists on account of the picturesque dress of the women. Good wine is produced in the vicinity, wool is manufactured, and there are two annual fairs.—The ancient Frusino was originally a town of the Hernici in Latium, and subsequently a Roman colony, and long retained some prosperity, mainly on account of its situation on the Via Latina. The legation of Frosinone was styled the Tyrol of the pope, on account of its mountainous character and the simple habits of the people.

FROSSARD, Charles Auguste, a French soldier, born April 26, 1807, died Sept. 1, 1875. He was educated at the polytechnic school in Paris and the military school in Metz, participated in the Belgian campaign of 1831-'2, was made a captain, went to Algeria in 1833, and returned to Paris in 1846 with the rank of major. In 1849-'50 he commanded the corps of engineers in Rome. In 1853 he was director of the fortifications of Oran in Algeria. During the Crimean war he acted as chief of engineers of the army of the East. He returned again to Algeria, where he remained till 1859, when he was ordered to Italy with the rank of general. At the close of the war he was made grand officer of the legion of honor, and appointed governor of the imperial prince. At the beginning of the Franco-German war he obtained command of the 2d corps of the army of the Rhine, and opened the war by an attack upon Saarbrück, Aug. 2, 1870. Four days later he was defeated at the Spichern heights, between that town and Forbach, and withdrew to Metz, fought at Courcelles, Mars-la-Tour, and Gravelotte, was made a prisoner at the surrender of the fortress, and was detained in Frankfort till the close of the war. He published, in justification of himself, *Rapport sur les opérations du 2^m corps de l'armée du Rhin dans la campagne de 1870* (2 vols., Paris, 1872).

FROST (from the root of *freeze*), in a general sense, the act or process of freezing, but more commonly used to signify crystals of frozen dew; in the latter case called also hoar frost. When the atmosphere contains so little aqueous vapor or is itself already at so low a temperature that a reduction to a point below 32° F. is necessary before condensation can take place, the deposit will be frozen, and instead of being technically dew it will have the form of hoar frost. The process is precisely similar to the deposition of crystals of salts from their solution in water. In this latter case the operation

must be conducted slowly and at a certain low temperature; if the water be evaporated by violent ebullition, we have an amorphous powder, but no true crystals. In a similar manner the atmosphere deposits its aqueous burden in crystals or liquid form according to the temperature. The most remarkable formations of frost are witnessed on the summit of Mount Washington during the autumn and winter, when crystals a foot or more in length attach themselves to every object. The conditions favorable to frost are but an exaggeration of those that facilitate the formation of dew. The destructive effects of frosts on tender vegetation, and their beneficial influences in a sanitary point of view, have caused much attention to be given to this phenomenon. In the Mississippi valley it is commonly said that the spread of the yellow fever is completely checked by a heavy frost. This however was notably not the case in 1878; and it may be fairly questioned whether some other agency, especially the dryness of the air, be not the true antagonistic element. Whatever hinders the deposition of dew acts also to mitigate the severity of a frost; to this end a thin or loose covering of cloth, straw, &c., is sufficient. In low flat regions it is found practicable to produce clouds of smoke, which, lying quiescent above the regions to be protected, serves to completely protect the ground from the radiation and consequent frost.—The word frost is somewhat loosely applied also to the action of winter's cold in freezing the solid ground and the water it may contain, when the frost is said to be in the ground; again, in the spring, the frost is said to come out of the ground. These expressions allude of course to the simple phenomenon of freezing, and not to the frost deposited on the surface of grass, plants, &c. The effect of cold in freezing the water within the earth and the crevices of wells is recognized as a powerful agent in the preparation of the earth, for cultivation and the growth of forests, and is sometimes called into requisition in the quarrying of rocks. The term frostwork is applied to the formation of ice crystals on the inside surface of the window panes of a warm room. During cold weather the glass panes are cooled to a temperature below the freezing point, and a coating of true dew is deposited upon them; this dew water is then cooled and frozen by the continued cold of the pane of glass. The phenomenon is that of the freezing of a thin film of water, not that of the direct deposition of ice crystals as in the true frost. A similar distinction is to be made in the case of the formation of snow and of hail. In the former the minute crystals are deposited at a temperature lower than the freezing point; but in the formation of hail the water is deposited first, and the freezing is a subsequent process. Black frost is the effect produced when the moisture within a plant is frozen, but without any hoar frost being deposited on its exterior.

FROST, William Edward, an English painter, born at Wandsworth in 1810, died Aug. 5, 1877. He commenced his career as a portrait painter, and executed in the course of 14 years upward of 800 pictures of this class. In 1839 he attempted historical composition, and his "Prometheus Bound," exhibited in that year, gained the gold medal at the academy. In 1843 he won a prize of £100 in the Westminster hall competition by his cartoon of "Una alarmed by Fauns." He afterward confined himself chiefly to classical subjects. Among his principal pictures are the "Disarming of Cupid" and the "Bacchanalian Revel." He was elected a royal academician Dec. 30, 1870.

FROTHINGHAM, I. Nathaniel Langdon, an American clergyman, born in Boston, July 23, 1793, died there, April 4, 1870. He graduated in 1811 at Harvard college, where in the following year he became instructor in rhetoric and oratory. In the mean time he studied theology, and in 1815 was ordained pastor of the first Congregational church in Boston. This charge he retained till ill health compelled his resignation of it in 1850. He was the author of more than 50 sermons published occasionally, and of a volume of "Sermons in the Order of a Twelvemonth" (Boston, 1852). He also contributed in prose and verse to periodicals, and a collection of his poems has been published under the title of "Metrical Pieces, Translated and Original" (Boston, 1855). They are distinguished, like his prose writings, by singular refinement of sentiment and grace of expression. **II. Octavius Brooks**, an American clergyman, son of the preceding, born in Boston, Nov. 26, 1822. He graduated at Harvard college in 1843, spent three years in the Cambridge divinity school, and was settled as pastor of the North church (Unitarian), Salem, Mass., March 10, 1847. He removed to Jersey City, N. J., in May, 1855, where he preached till May, 1859, when he accepted a call to New York, and became pastor of a congregation which in 1860 was organized under the name of the "Third Unitarian Congregational Church." He is distinguished for the intellectual character of his preaching, his wide scholarship in various branches of learning, and his impressive eloquence. He is one of the principal leaders of the so-called free religious movement, which has for its object the promotion of rationalist ideas in theology, in place of the received doctrine of the Christian church. He has written extensively for various journals, contributed numerous papers to prominent reviews, and, besides publishing more than 150 sermons, is the author of the following works: "The Parables" (Boston, 1864); "Stories from the Old Testament" (Boston, 1864); "Renan's Critical Essays," translated (New York, 1864); "The Child's Book of Religion" (New York, 1871); "The Religion of Humanity" (New York, 1872); and "The Life of Theodore Parker" (Boston, 1874).

FROTHINGHAM, Richard, jr., an American historian, born in Charlestown, Mass., Jan. 31, 1812. He was for many years a member of the staff of the "Boston Post," was chosen to the Massachusetts house of representatives by his native town in 1839, '40, '42, '49, and '50, and was mayor of Charlestown for three terms (1851-'3). In 1851 he was a delegate to the national convention of the democratic party, and in 1852 promoted the election of Mr. Pierce as president. He was elected in 1853 to the convention called to revise the constitution of Massachusetts, and took an active part in its debates. He has published "History of Charlestown" (1848); "History of the Siege of Boston, and of the Battles of Lexington, Concord, and Bunker Hill" (1849); "Account of the Bunker Hill Monument" (1849); "Life of Gen. Joseph Warren" (1865); and "Rise of the Republic" (1872).

FROUDE, I. James Anthony, an English historian, a son of Archdeacon Froude, born at Dartington rectory, Totness, Devonshire, April 23, 1818. He entered Oriel college, Oxford, in 1836, took his degree in 1840, and two years after obtained the chancellor's prize for an English essay, and was elected fellow of Exeter college. His sympathy with the high church views which then prevailed led him to entertain the idea of studying for the ministry; and he proceeded so far as to be ordained deacon in 1845. But he never undertook any clerical duty, and soon abandoned theology for literature. In 1847 he published a volume of stories, entitled "The Shadows of the Clouds," and in 1849 "The Nemesis of Faith," both of which were condemned by the university authorities. Soon after the publication of the latter Mr. Froude resigned his fellowship, and was obliged to give up an appointment which he had received to a teachership in Tasmania. For two or three years he wrote almost constantly for "Fraser's Magazine" and the "Westminster Review." One of his articles in the latter on the book of Job has been reprinted in a separate form. In 1856 he published the first two volumes of his "History of England from the Fall of Wolsey to the Defeat of the Spanish Armada," which was continued from time to time till its completion in 1870, in 12 volumes. His contributions to various periodicals have been reprinted under the title of "Short Studies on Great Subjects" (1st series, 1867; 2d series, 1871). He also published in 1871 a small volume on Calvinism. He was installed as lord rector of the university of St. Andrews in March, 1869. In 1872-'3 he delivered a series of lectures in the United States on "The English in Ireland in the Eighteenth Century," which have since been published (3 vols., London, 1873-'4). His "History of England" attempts to show that Henry VIII. was a much better man than he has been commonly represented to be, and that Queen Elizabeth was indebted for her high reputation as a sovereign chiefly to the abilities of her min-

isters. His delineation of the character of Mary queen of Scots is very severe, and has given rise to much controversy. **H. Richard Burrell**, brother of the preceding, an ardent supporter of the "Oxford movement" in the church of England in its earlier stages, born March 25, 1808, died Feb. 28, 1886. He was educated at Eton and Oxford, in 1826 was elected fellow of Oriel college, and three years after was ordained by the bishop of Oxford. Four volumes of "Remains," made up of extracts from his journals, correspondence, and writings, in which may be seen the Roman tendencies of the Oxford movement even at that period, were published in London in 1838.

FRY, Elizabeth, an English philanthropist, born at Bramerton, near Norwich, May 21, 1780, died in Ramsgate, Oct. 12, 1845. She was the daughter of John Gurney of Norwich. The family belonged to the society of Friends, but did not adhere strictly to its usages either in dress, language, or social habits. But in 1798 William Savery, an American Quaker, visited England, and by his means Elizabeth was converted to the strict piety and customs of a "plain Friend." In 1800 she was married to Joseph Fry, and in 1810 she became a minister. In 1813 she made her first visit to Newgate prison, and in 1817 succeeded in establishing a school and manufactory within the prison, organized a ladies' association for the reformation of the prisoners, and thenceforward devoted all her energies to the promotion of prison reform. Within a few years her influence was apparent in most of the jails, houses of correction, lunatic asylums, and infirmaries of the United Kingdom. From 1837 to 1842 she made several journeys in France and in northern and central Europe, visiting prisons, and expounding her plans of improvement to the public authorities.—See "Memoirs of Elizabeth Fry, with Extracts from her Journals and Letters, edited by Two of her Daughters" (2 vols., London, 1847).

FRY, William Heary, an American composer and journalist, born in Philadelphia in August, 1815, died in the island of Santa Cruz, Dec. 21, 1864. His father, William Fry, was proprietor of the "National Gazette" of Philadelphia. His aptitude for music was very early manifested. His first orchestral productions were four overtures performed by the philharmonic society of Philadelphia in 1835, for which he received an honorary medal from the society. In 1839 he became regularly connected with the "National Gazette," and in 1844 he was engaged as editor of the Philadelphia "Ledger." In 1845 his opera of "Leonora" was performed in Philadelphia, and in 1858 an Italian version of it was produced. In 1846 he visited Europe, and remained there six years, residing chiefly in Paris, and corresponding with various newspapers. In 1852 he delivered in New York a series of ten lectures on the history of music, as illustrations to which he composed two symphonies, "The

Breaking Heart" and "A Day in the Country;" these, with the symphonies "Santa Claus" and "Childe Harold," were performed by Julien's band. He published a *Stabat Mater*, with full orchestral and vocal score. After his return from Europe he was attached for the rest of his life to the staff of the "New York Tribune." He was also a political orator, and a popular lecturer on miscellaneous subjects.

FRYKEN, a series of small lakes of Sweden, about 12 m. N. W. of Lake Wener. They consist of three distinct parts connected by narrow channels, extend about 40 m. from S. to N., and present the appearance of a large river. They are situated in the Frykedal, renowned for its beautiful scenery. At the N. end of the lakes is the village of Frykoende, and at the S. extremity is the small town of Frykstaden.

FRYXELL, Anders, a Swedish historian, born at Hesselkog, in Dalecarlia, Feb. 7, 1795. He studied in the university of Upsal, became a professor, a clergyman, and provost of North Wermland, which post he resigned in 1847 to devote himself exclusively to his historical labors, in the course of which he had visited many countries. His fame rests upon his *Berättelser ur Svenska Historien* ("Narratives of Swedish History," 34 vols., 1823-'64), part of which, relating to Gustavus Adolphus, has been translated into several languages.

FUAD PASHA, a Turkish statesman, born in Constantinople about 1814, died in Nice, Feb. 11, 1869. He received an excellent education, and his father's fortune having been confiscated by Sultan Mahmoud, he studied medicine. In 1834 he was appointed physician to the admiralty and accompanied the naval expedition to Tripoli. Returning to Constantinople, he entered the diplomatic service, and in 1840 became an attaché of the Turkish embassy in London, and in 1843 second dragoman of the Porte and director of the bureau of translation. After having fulfilled special missions in Spain and Portugal, he was made first dragoman in 1845, grand referendary of the divan and commissioner general in the Danubian principalities in 1848, minister of the interior in December, 1849, and minister of foreign affairs in 1852. He strenuously opposed the Russian pretensions which led to the Crimean war, and resigned his office in March, 1853, in consequence of a dispute with Prince Menshikoff, the Russian ambassador. In 1854 he quelled insurrectionary movements in Epirus, afterward became a member and president of the newly established council (*tansimat*), and acted again for several years as minister of foreign affairs. In 1860-'61 he distinguished himself as a commissioner in Damascus and the Lebanon, and in November, 1861, became grand vizier. He resigned in 1868, and was minister of war from that period till 1866. His previous administration of financial affairs had somewhat impaired his popularity, but his prestige in Europe as a brilliant diplomatist led to his return

to the foreign office in 1867, Aali Pasha being grand vizier. He urged the sultan to visit the principal European sovereigns, accompanied him on the journey, and died while residing at Nice for the benefit of his health. He was European in his manners and in many of his views, spoke French fluently, and was regarded as the ablest Turkish statesman of his day. He was fond of poetry, and was one of the earliest members of the Turkish academy of science and literature. He published a Turkish grammar (1852), and *La vérité sur la question des saints lieux* (1853).

FUCA, or **Juan de Fuca**, Strait of, a body of water lying between the N. W. portion of Washington territory and the S. E. extremity of Vancouver island. It enters the Pacific at Cape Flattery, and communicates with the gulf of Georgia through Rosario and Haro straits. It is about 80 m. long, 11 m. wide at its W. and 25 m. at its E. end, and free from shoals.

FUCHS, **Johann Nepomuk von**, a German chemist, born at Mattenzell, May 15, 1774, died in Munich, March 5, 1856. He was professor of mineralogy and chemistry at Landshut and subsequently in Munich, where he was also appointed keeper of the mineralogical collections, and held other important functions in connection with scientific departments. He made various chemical discoveries and researches, and was especially distinguished for his invention of soluble glass and its application to stereochromy, as explained in his *Bereitung, Eigenschaften und Nutzanwendung des Wasserglases* (1857). Among his most valuable contributions to mineralogy is his *Naturgeschichte des Mineralreichs*, included in his *Gesammelte Schriften* (1856). His life has been written by Kobell (1856).

FUCHS, **Karad Heinrich**, a German physician, born in Bamberg, Dec. 7, 1808, died in Göttingen, Dec. 2, 1855. He studied at Würzburg, where he became an assistant of Schönlein, and was subsequently professor there, and from 1838 in Göttingen. He was a high authority on nosology, diagnostics, and therapeutics. His principal works are: *Die krankhaften Veränderungen der Haut und ihrer Anhängen* (3 vols., Göttingen, 1840-'41); *Die ältesten Schriftsteller über die Lusteuche in Deutschland* (1845); and *Lehrbuch der speciellen Nosologie und Therapie* (4 vols., 1845-'8).

FUCHS, or **Fuchsianus**, **Leonhard von**, a German botanist, born at Wemdingen, Swabia, Jan. 17, 1501, died May 10, 1566. He studied at Erfurt and Ingolstadt, adopted the doctrines of Luther, became in 1526 professor of medicine at Ingolstadt, and in 1528 first physician to the margrave of Anspach, and held the chair of medicine at Tübingen from 1535 till his death. He was knighted by Charles V. He contributed much toward overthrowing the authority of the Arab physicians and restoring the Greeks to honor. As a botanist he corrected many current errors in the nomenclature of plants. An American plant, the fuchsia, bears his

name. He wrote a number of medical and botanical works, of which the most important is *De Historia Stirpium* (fol., Basel, 1542).

FUCHSIA, popularly called **LADIES' EARDROP**, a genus of ornamental and mostly very showy plants, belonging to the natural order *onagraceae*. The flowers of the fuchsia have the tube of the calyx adherent to the ovary, with the limb four-lobed, spreading or recurved; four petals, attached to the calyx tube, and usually shorter than the calyx lobes and of a different color; eight stamens, and a threadlike style. The fruit is a four-celled, many-seeded berry, which is ovate-globose or oblong in shape. The species are shrubs or small trees, having usually opposite leaves, the flowers borne upon single axillary pedicels, or sometimes they are disposed in racemes at the ends of the branches. Perhaps the history of no other greenhouse plant presents so many interesting items as do the changes produced by the hybridizing and rearing of new varieties of this elegant flower. Loudon, in his "Encyclopædia of Plants" (1829), gives only four species and a single variety; in his "Arboretum et Fruticetum Britannicum" (1844) he gives 21 species. At present there are about 50 admitted species, while the varieties produced by cultivators are almost innumerable, each year bringing a long list of "novelties" in fuchsias. With the exception of two found in New Zealand, the genus is an American one, most of the species being natives of the Mexican and Brazilian mountains. The fuchsias in cultivation may be divided into three sections: the long-flowered, the short-flowered, and those with the flowers in panicles. Among the short-flowered fuch-

Fuchsia coccinea.

sias is *F. coccinea* (also called *F. globosa* by some florists) from Chili, which for many years was the only kind known in the United States, and considered not more than 40 years ago one of the most elegant of plants, conspicuous for its axillary and drooping flowers,

with scarlet calyx and violet-colored petals. In the long-flowered section the calyx tube is elongated to the length of two or three inches. *F. fulgens*, a brilliant Mexican species, belongs here, as does the corymbose fuchsia (*F. corymbiflora*, Ruiz and Pavon), the

Fuchsia fulgens.

flowers of which are 2 in. long, scarlet, and hang down in beautiful corymbs; an elegant shrub about 6 ft. high, native of Peru about Chincho and Muna. As an example of those with panicle or clustered flowers, we may cite the tree-like fuchsia (*F. arborescens*), which not unfrequently attains a height of 15 ft.; its branches are smooth, the leaves disposed in

Fuchsia corymbiflora.

whorls of threes, oval-oblong, acuminate at both ends, petiolate, quite entire; the panicle terminal, trichotomous, nearly naked; the calyx funnel-shaped, with the lobes ovate-acute, spreadingly reflexed, as are also the petals; a native of Mexico. It would be difficult,

if not impossible, to determine at this time from what species the present highly reputed varieties have been obtained, as they have been hybridized and crossed to such an extent that the typical forms are obliterated. We have now both double and single varieties; indeed, in some the petals are multiplied to an extent that renders the flowers monstrous, and there is one variety in which not only is the number of petals increased, but the long stamens have become petaloid and give the flower a singular two-storied appearance. In a florist's classification we have: calyx red and corolla white, both single and double; calyx red and corolla purple or bluish, single and double; and calyx white and corolla red or other color, single and double. Besides these sections, under each of which there are many varieties, there are a few kinds with variegated foliage. The taller growing kinds are frequently trained to single stems, and form superb-looking objects for the conservatory. Mr. Downing thought the *F. corallina*, among many kinds, was the finest sort for this treatment. The flowers are seen at their best when viewed from below, and these "pillar" fuchsias, as they are called, lift their flowers well above the observer's head; we have seen the same effect produced by training the plants to the rafters of a greenhouse. Fuchsias are admirable plants for summer decoration; the winter-blooming kinds are few, and disappointment often results from a want of knowledge of this fact. They are used in England to some extent as bedding-out plants, but the heat of our summers is too severe for these natives of the Brazilian mountain forests. Their proper use is in the summer decoration of rooms, conservatories, and verandas, though in a well shaded place they may be turned into the open border. When they have finished flowering the plants should be allowed to rest and be kept in the cellar until February or March, when they may be brought into growth. Fuchsias are propagated with the greatest ease from cuttings of the new shoots; a cutting an inch or two long, if properly treated, may be grown to a plant several feet high in a single season. Owing to the readiness with which shoots start from the stem, the plants are readily trained to a pyramidal, bush, or globular form. The wood of *F. coccinea* is used in Chili to make a black coloring matter, and the leaves and branches are used for some kinds of medicine. The berries of *F. microphylla* are very sweet. Those of *F. excorticata*, a native of New Zealand, are greedily eaten by swine; and so sweet are they when ripe, that attempts have been made to use the species as a sugar plant.

FUCUS (Gr. *φύκος*, a seaweed), a genus of marine melanospermous algae. Of this genus, which is readily recognized by the inflated air vessels in the substance of the stem or branches, there are but two species upon the Atlantic coast of the United States, two on the Pacific coast, and two upon the coasts of Greenland

and Newfoundland. They are found upon rocky shores growing between high and low water marks. Our Atlantic species, *fucus vesiculosus* and *F. nodosus*, are popularly called rock-weed and bladder-weed, and form a large share of the vegetation of the tidal rocks from New Jersey northward, where they are conspicuous at low tide and give the rocks a very sombre appearance. Upon the shores of northern Europe the species of fucus are valued as furnishing an important part of the winter fodder of cattle, the animals being regularly driven to the pasturage at the recess of the tide; in some localities these seaweeds are collected and boiled with coarse meal as a food for animals. The chief value of these plants upon our coasts is as a fertilizer, and in some localities large quantities are collected to apply to the land, where they rapidly decompose. Before the discovery of the process of preparing soda from common salt, the species of fucus were of considerable economical importance, as their ashes, called kelp, were the chief source of soda, and afforded a large income to the owners of estates upon the coasts of Great Britain and Ireland, as well as to the inhabitants of the Orkney, Shetland, and other islands. But little kelp is now produced, as other sources furnish soda more cheaply; but some is still burned for the purpose of procuring iodine, of which the fuci and the related seaweeds are the only available source.— Besides living species of fuci, there are others of particular interest from the occurrence of their fossil remains in the most ancient stratified rocks, associated with those of the oldest forms of animal life, also marine, to which they no doubt served as nutriment. They are abundantly met with in the sandstones of the Appalachians, covering the surface of the slabs with irregularly shaped ridges. The flagstones obtained from the Portage group of the New York system so abound with them, that the fossils are seen in every village where these stones are used for the sidewalks. They are particularly noted in the streets of Geneva, N. Y. (See Hall's "Geology of New York," p. 242.) The fossil fuci of the most ancient formations, according to A. Brongniart, are most nearly related to existing species, which belong to tropical climates; but the forms of marine vegetation found fossil in the rocks of the secondary and tertiary formation resemble those now living in temperate climates.—Some species of algæ formerly placed in the genus *fucus* and others related to it, found about the islands off the southern extremity of South America, are so remarkable as to deserve particular notice. They grow up from deeply sunken rocks, and spread over the surface of the ocean, presenting the appearance of extensively inundated meadows. Ships penetrate with difficulty through the obstructions they present. The stems grow very rapidly, and have been known to attain the length of 700 ft.; Lamouroux describes them as even exceeding

800 ft.; the Agassiz expedition, in the United States coast survey steamer Hassler (1872), found specimens 1,000 ft. long. Dr. J. D. Hooker, in the "Botany of the Antarctic Voyage of H. M. Discovery Ships Erebus and Terror, in the Years 1839-43," gives an interesting account, among others, of the gigantic *Lessonia fucescens* and *macrocystis*. Seen from the surface in sailing over them, they appear like groves of trees, their stems from 8 to 10 in. in diameter, and the branches of the former species spreading out and dividing into sprays, from which the leaves are suspended. Covered with parasitic algæ, and with numerous species of adhering shell fish, as the chitons and patellæ, and many crustacea and radiata swarming among their tangled roots, while fish of different species are seen darting through their foliage, they remind one of the coral reefs of tropical seas. Their stems strewn upon the beaches appear like drift-wood, and, as they decay, exhale an almost insufferable odor like that of putrid cabbage. The *macrocystis pyrifera* is a conspicuous species of the N. W. coast, and is also found in the south Atlantic. It forms stems from 5 ft. to several hundred feet long, which bear pear-shaped air vessels. It is seen upon the beaches rolled up by the waves in great strands larger than a man's body, entangled one with another. The harbors about the Falkland islands, Cape Horn, and Kerguelen Land are so filled with it that boats can hardly be forced through.— The charcoal of *fucus vesiculosus*, or bladder-weed, has been used in goitre and scrofulous affections. Its efficacy depends upon the iodine which it contains, although in much less quantity than *F. digitatus* (or *laminaria digitata*) and other deep-sea plants. The whole plant has been employed in substance, decoction, and extract, for the purpose of diminishing obesity, and with alleged success. *F.* (or *gigartina*) *helminthocorton* has some reputation in Europe as an anthelmintic, and is said also to be a febrifuge.

FUEL, the material used for producing heat by combustion. Wood, the most universally known variety of fuel, presents itself in forms and qualities varying with the tree, and to some extent with the part from which it is obtained. It is made up of several compounds—the woody tissue or lignine, the sap, and the alkaline and earthy matters which remain after combustion as its ash. It also contains a variable proportion of water. The first two named are its combustible ingredients, upon which its value as fuel depends; and of these the lignine is of chief importance, often constituting in thoroughly dried wood 95 per cent. or more of its weight. Yet it is not the ingredient which gives to the wood its distinctive character, except so far as this depends on its density, for pure lignine, freed from the matters soluble in water, alcohol, or alkalies, is of uniform composition in all woods and leaves. The sap and the matters it brings with it differ in the differ-

ent woods; on those of the pine family the sap bestows their resinous properties, on the oak its tannin, and on all the peculiar extractive matters which distinguish them. Its proportion is small in the mass of the wood, and varies at different seasons. Schübler found that the ash tree felled in January contained of water 28.8 parts, while that cut in April contained 38.6 parts; the sycamore, 33.6 in January, and 40.3 in April; the white fir, 52.7 and 61.0. As the expulsion of the water present involves the consumption of a portion of the carbon of the wood, the more thoroughly this is air-dried or seasoned, the greater is its heat-producing power. As it dries it loses sometimes one fifth of its weight, yet from 20 to 25 per cent. of that which remains is moisture. If this be all expelled, the wood will absorb from the air 10 per cent. or more of moisture. The mean quantity of hygrometric water in 100 parts of various specimens of wood is thus given in the treatise of Richardson and Ronalds; in cord wood the seasoning would not have been so effectual as in the specimens employed:

SIX MONTHS AFTER FELLING.	Resinous woods.	Non-resinous woods.
Trunk wood.....	29	26
Brush wood.....	32	34
Young branch wood.....	33	36
IN THE DRIEST STATE.		
Trunk wood.....	15	17
Brush wood.....	15	20
Young branch wood.....	15	9

The gravity of wood varies greatly with the different species, and also with its condition as to dryness. Though the solid fibre is heavier than water, the air contained in the cells causes it commonly to float. As the fibre is the heaviest ingredient, a greater weight in dry wood indicates a greater proportion of woody or combustible matter. The experiments of Marcus Bull upon American woods were conducted with great nicety, the specific gravity of each being taken by coating the dry sample with a varnish of the same weight as water, thus retaining the air in the cells. The table on p. 517 is contained (except changes in some of the names) in his original memoir, read April 7, 1826, and published in the "Transactions of the American Philosophical Society" (vol. iii., new series, pp. 1-60). This gives the weight of a cord of wood as it should be put up, the interstitial matter even then amounting to 44 parts in 100 of the whole bulk; as it often much exceeds this, the measure affords an estimate of the quantity of woody matter even more uncertain than would be the estimate by weight, variable as this has been shown to be. The arrangement of the columns is as follows: A, specific gravity; B, lbs. avoirdupois in one cord; C, charcoal in 100 parts of dry wood by weight; D, specific gravity of dry coal; E, lbs. of dry coal in one bushel; F, lbs. of dry coal from one cord of dry wood; G, bushels

of coal from one cord of dry wood; H, time in hours and minutes during which 10° of heat were maintained in the room by the combustion of 1 lb. of each wood; I, value of specified quantities of each wood compared with shell-bark hickory as the standard.—When wood is exposed to the action of heat, its more volatile ingredients, as the hygrometric moisture, first escape; its gaseous elements are next disturbed from their state of equilibrium, and the hydrogen and oxygen when set free from one combination enter into new ones; portions of these gases combine to produce water; other portions seize upon the carbon and form with this a multitude of unstable compounds, varying with the degree of temperature and the proportions of the elements present. If the process be conducted in close vessels away from the action of air or oxygen, the volatile ingredients may be driven off in the form of inflammable gases, and of vapors of water holding in solution numerous combustible principles, and last of all the vapors of the resins and ethereal oils constituting tar. When wood is consumed in the air, heat is first applied to drive out the volatile elements. The hydrogen eliminated in the pores of the fuel at a heat below that of redness takes hold of a portion of the solid carbon, and meeting the air they rapidly enter into combination with oxygen. New supplies of the volatile ingredients are disturbed further within the mass of the burning body, and there by their ignition serve to keep up the process. If the supply of oxygen is sufficient, the combustion is complete, and the volatile products of the distillation process, if generated at all, pass immediately into the stable compounds of carbonic acid and water. The carbon attacked at its surface by the oxygen of the air yields more slowly, and a portion of it is left behind after the flame and rapid chemical action caused by the combustion of its volatile associates have disappeared. When concentration of heat is required, as in the smelting of ores, a condensed form of fuel like charcoal is more effective than one containing gaseous elements, which in their combustion dispense a very uncertain amount of heat, as they flit, perhaps but partially consumed, past the points where the effect is wanted, carrying with them a portion of the carbon of the fuel, and also more caloric rendered latent than the product of combustion of an equal weight of carbon is capable of absorbing. The difference in the pyrometrical effect of wood and charcoal would be still greater than it is, were it not for the property of charcoal of rapidly absorbing moisture from the air. When it is desirable to apply the heat generated by combustion at a distance from the fire, as in reverberatory furnaces, fuel is preferred that burns with a flame.—As charcoal is obtained from wood by charring, so from peat this fuel is obtained in a condensed form called peat charcoal, and from the bituminous coals the mine-

TABLE SHOWING THE COMPARATIVE VALUE OF DIFFERENT WOODS AS FUEL.

VARIETY OF WOOD.	A.	B.	C.	D.	E.	F.	G.	H.	I.
White ash, <i>fraxinus Americana</i>	0.773	8,450	25.74	0.547	28.73	888	31	6 40	77
Apple, <i>pyrus malus</i>	0.897	8,115	25.00	0.445	28.41	779	38	6 40	70
White beech, <i>fagus ferruginea</i>	0.734	8,238	19.63	0.518	27.26	685	28	6 00	65
Black birch, <i>betula lenta</i>	0.697	8,115	19.40	0.438	22.52	604	27	6 00	68
White birch, <i>B. alba populifolia</i>	0.580	2,389	19.00	0.364	19.15	450	24	6 00	43
Butternut, <i>juglans cinerea</i>	0.567	2,584	20.79	0.287	12.47	527	42	6 00	51
Red cedar, <i>juniperus Virginiana</i>	0.565	2,525	24.73	0.288	12.52	624	50	6 40	56
American chestnut, <i>castanea vesca</i>	0.522	2,388	25.29	0.379	19.94	590	30	6 40	52
Wild cherry, <i>cerasus Virginiana</i>	0.597	2,668	21.70	0.411	21.68	579	27	6 10	55
Dogwood, <i>cornus florida</i>	0.815	8,648	31.00	0.550	28.94	765	26	6 10	75
White elm, <i>ulmus Americana</i>	0.580	2,592	24.55	0.357	18.79	644	34	6 40	58
Sour gum, <i>nyssa multiflora</i>	0.708	8,142	22.16	0.400	21.05	696	38	6 20	67
Sweet gum, <i>liquidambar styraciflua</i>	0.684	2,584	19.69	0.418	21.73	558	26	6 00	57
Shell-bark hickory, <i>carya alba</i>	1.000	4,469	26.23	0.625	32.89	1,173	36	6 40	100
Pig-nut hickory, <i>C. porcina</i>	0.949	4,241	25.23	0.637	38.72	1,070	32	6 40	95
Western hickory, <i>C. vulcata</i>	0.829	8,705	22.90	0.509	26.58	848	39	6 30	51
White hazel, <i>hamamelis Virginica</i>	0.734	8,505	21.40	0.368	19.36	750	39	6 10	73
American holly, <i>Ilex opaca</i>	0.602	2,691	22.77	0.374	19.68	618	31	6 20	57
American hornbeam, <i>carpinus Americana</i>	0.730	8,218	19.00	0.455	23.94	611	25	6 00	65
Mountain laurel, <i>kalmia latifolia</i>	0.668	2,968	24.02	0.457	24.05	719	30	6 40	68
Hard maple, <i>acer saccharinum</i>	0.644	2,573	21.43	0.431	22.63	617	27	6 10	60
Soft maple, <i>A. rubrum</i>	0.597	2,668	20.64	0.370	19.47	551	28	6 00	54
Large magnolia, <i>magnolia grandiflora</i>	0.605	2,704	21.59	0.406	21.36	584	27	6 10	58
Chestnut white oak, <i>quercus prinus</i>	0.885	8,955	22.76	0.481	25.31	900	36	6 30	88
White oak, <i>Q. alba</i>	0.855	8,321	21.62	0.401	21.10	826	39	6 20	51
Post oak, <i>Q. obtusiloba</i>	0.775	8,464	21.50	0.487	22.99	745	33	6 20	74
Barren scrub oak, <i>Q. Catesbeii</i>	0.747	8,389	22.17	0.393	20.63	774	33	6 30	73
Pin oak, <i>Q. palustris</i>	0.747	8,389	22.29	0.436	22.94	742	33	6 20	71
Scrub black oak, <i>Q. ilicifolia</i>	0.738	8,254	22.80	0.387	20.38	774	33	6 20	71
Red oak, <i>Q. rubra</i>	0.728	8,254	22.43	0.400	21.05	630	30	6 20	69
Barren oak, <i>Q. nigra</i>	0.694	8,102	22.87	0.447	22.52	694	29	6 20	66
Rock chestnut oak, <i>Q. prinus monticola</i>	0.678	8,080	20.88	0.436	22.94	632	28	6 00	61
Yellow oak, <i>Q. prinus acuminata</i>	0.658	2,919	21.60	0.295	15.52	631	41	6 10	60
Spanish oak, <i>Q. falcata</i>	0.648	2,449	22.95	0.368	19.05	562	30	6 20	58
Perdamaian, <i>disopyros Virginiana</i>	0.711	8,173	23.44	0.469	24.68	745	30	6 30	69
Yellow pine, soft, <i>pinus mitis</i>	0.651	2,463	22.75	0.333	17.52	535	33	6 30	54
Jersey pine, <i>P. inops</i>	0.473	2,137	24.68	0.335	20.26	539	26	6 40	43
Pitch pine, <i>P. rigida</i>	0.426	1,906	26.73	0.293	15.63	510	33	6 40	43
White pine, <i>P. strobus</i>	0.418	1,863	24.85	0.238	15.42	405	30	6 40	42
Yellow poplar, <i>Liriodendron tulipifera</i>	0.598	2,516	21.51	0.338	20.15	549	27	6 10	52
Lombardy poplar, <i>populus alata</i>	0.297	1,774	25.00	0.245	12.59	444	34	6 40	40
Sassafras, <i>sassafras officinale</i>	0.613	2,762	22.63	0.437	22.47	624	23	6 20	59
Wild service, <i>amelanchier Canadensis</i>	0.537	8,964	22.62	0.534	31.26	897	29	6 20	84
Sycamore, <i>platanus occidentalis</i>	0.535	2,391	22.60	0.374	19.63	564	29	6 20	52
Black walnut, <i>juglans nigra</i>	0.651	8,444	22.56	0.413	22.00	637	31	6 20	65
Swamp whortleberry, <i>vacinium corymbosum</i>	0.753	8,361	22.30	0.505	26.57	758	29	6 30	73

ral charcoal or coke. Peat, which is found in great abundance and easily procured in many of the European countries, where other fuels are scarce, is there much more highly appreciated than it is in the United States. Its qualities have there been thoroughly investigated, and various methods have been contrived for improving its adaptation to the uses for which it is fitted. (See PEAT.) As a fuel, this material is much used for domestic purposes in the countries where it abounds, and it is applied both in the raw state and charred to manufacturing operations. In the neighborhood of Carolinen-Hütte, near Aichthal, in Styria, successful attempts have been made to smelt iron with it in its raw state, mixed with wood; while the charcoal obtained by charring it has long been successfully applied to the same purpose in Bohemia, Bavaria, France, Russia, and other countries. When freshly cut, peat contains from 80 to 90 per cent. of water, which by drying is commonly reduced to about 25 per cent. When well dried, the heating power of good peat is about the same as that of wood, and about half that of bituminous coal. The following analyses by Sir Robert Kane and Dr. W. K. Sullivan are of peat dried at 220° F. The proportions are calculated after deducting

the ash. The percentage of the mineral ingredients varies in good peat from 1 to 5; some qualities contain much more, even 33 per cent., but such are worthless for fuel.

VARIETIES.	Carbon.	Hydrogen.	Oxygen.	Nitrogen, mean.
Surface peat, Phillipstown..	58.694	6.971	32.863	1.4514
Dense peat "	50.476	6.097	32.546	0.8906
Light surface peat, wood of Allen.....	59.920	6.614	32.207	1.2588
Dense peat, wood of Allen..	61.022	5.771	32.400	0.8070
Surface peat, Twickenham..	60.102	6.723	31.288	1.8966
Light surface peat, Shannon	60.018	5.875	33.152	0.9545
Dense peat, "	61.247	5.616	31.446	1.6904

—The Chinese have for ages been in the habit of mixing the dust from their coal mines with clay and bitumen, and also with refuse matter, and such artificial fuel is in China an article of considerable traffic. The methods introduced in western Europe of utilizing the dust of mineral coals and of charcoal are nearly all based upon the principle of making these substances cohere by thoroughly incorporating them with tar or pitch, and then exposing the compound, when moulded into blocks, in some cases to a current of air to dry them, and in others to a high temperature in vessels serving the pur-

pose of retorts. The former mode of drying is employed for mixtures of charcoal dust, tan, and similar substances, with tar or pitch, and the latter when refuse bituminous coal is used with about a quarter of its weight of pitch. Unless this distillation is conducted at a heat of from 400° to 600° F., so as to dispel the volatile ingredients, there is danger of subsequent spontaneous combustion. At Blanzky in France the coal is separated from the slaty and pyritous particles, and is then crushed and introduced into a circular metallic basin, which revolves horizontally in a reverberatory furnace, the flame of which passes under it. Hot tar or pitch is gradually let in upon the coal from a reservoir over the fire to the amount of 7 or 8 per cent., and the mixture is stirred by stationary rakes attached to rods let down through the arched cover. When sufficiently mixed, the materials are made to drop through the bottom into a receptacle, whence they are removed while plastic to the moulds and there pressed by the hydraulic machine. The process of Mr. Bessemer appears to be most highly approved. It is applied only to fine bituminous coal without mixture, the object being to render this plastic by heat and mould it by heavy pressure into convenient shapes. In the softening process the coal may be exposed to the heat long enough for a portion of its volatile elements to be expelled, by which the product is rendered more dense and of the nature of coke; or it may be softened so quickly as to be but slightly altered in its chemical composition. It is then formed into blocks by machinery working under great pressure. There are vast quantities of coal dust lying as waste material at the various extensive coal mines in this country, which might be utilized by mixing with proper proportions of the coal tar of gas works and compressed into bricks by machinery similar to that employed by Bessemer. There can be no doubt that fuel could be furnished in this way at an economical price.—The composition of fuels is commonly expressed by stating the proportions of coke or charcoal, volatile matters, moisture, and ash. The ultimate analysis reduces the whole to its elements, and expresses the proportions of carbon, hydrogen, oxygen, nitrogen, and the ingredients of the ash. In order to ascertain the fitness of fuel for making gas and producing the fatty products, the proportion of volatile ingredients must first be ascertained, and then the nature of these, as the proportion of the inflammable gases to the liquid products. For other purposes the simple form of analysis is commonly sufficient. The ash is obtained by thorough combustion in an open platinum crucible, continued till nothing is left but the gray or brown ash. The difference of weight of the crucible and its contents before and after the operation, deducted from the weight of the fuel employed, gives that of the ash. Another weighed sample subjected in a similar way to a heat of about 300° will give by loss of weight the amount of moist-

ure; the crucible containing it is then closely covered to exclude the air, and is set in a Hessian crucible also closed with a cover, and containing calcined magnesia. This supports the platinum crucible, and keeps it from contact with the outer one. The whole is now exposed to a red heat for an hour. The volatile matters are thus driven off, and the difference of weight of crucible and contents before and after the operation gives their proportions. The charcoal or coke is the difference between the crucible with the residuum it contains and that of the crucible alone less the weight of the ash. This may be again obtained by consuming the carbonaceous residue exposed to a current of air. The intense degree of heat evolved in the use of the condensed fuels adds largely to the capacity of heat of the aqueous vapor, and hence further lessens the value of hydrogen in fuels intended for the uses to which they are applied. But for other objects, requiring a quick heat and at the same time diffused over considerable space, the more inflammable fuels are found more efficient; and according to the mode in which their heating power is estimated they may even be classed as producing a greater amount of heat than the more carbonaceous varieties. Whenever the heat from the combustion of hydrogen can be concentrated, as in the oxyhydrogen blowpipe, a more intense degree is obtained than by the use of any other fuel. Other considerations, therefore, besides the chemical composition of fuels, affect their value. For practical purposes a mere change in the mechanical structure may give an entirely different character to them, while their real calorific power is not altered. This is apparent in the coals, which are rendered almost worthless when reduced to dust, until in the patent fuels they are reconverted into solid form. Wood possesses very different values in solid sticks, in shavings, and in sawdust. In ordinary use other circumstances are to be taken into account, as the arrangements for utilizing the heat produced, so that there shall be the least amount lost; also the provisions for insuring perfect combustion of the fuel. The loss of heat resulting from imperfect arrangements in these respects alone has been estimated at full one half of all that generated. The chimney necessarily carries off a considerable portion, as there will be no draught, and consequently no continued supply of air to support the combustion, unless the column floating upward by its rarity produces a partial vacuum to be filled with fresh air passing through the fire. The quantity of this admitted should be limited to a proper excess only of that absolutely required for the thorough combustion of the fuel, and this can be determined for each variety of fuel only by the experience and good judgment of the operator, the object in view being a uniform rate of combustion, more or less rapidly conducted, according to the fuel employed and the special purpose to which it is applied. The quantities necessary for complete combus-

tion of one pound of the different fuels are given in the following table, the temperature of the air being 66.2° F. and its weight 0.075 lb. :

NAME OF FUEL.	Cubic feet.
Peat.....	70 to 149
Peat charcoal.....	155 to 225
Bituminous coal, by the lead test (average 22%)..	170 to 279
Bituminous coal, Dr. Richardson.....	278 to 308
Bituminous coal, average qualities from the coal formation, Regnault.....	320 to 382
Bituminous coal from the upper secondary formation, Regnault.....	398 to 326
Coke.....	194 to 250
Anthracite, by the lead test.....	238 to 277
Anthracite, Regnault.....	312

—The qualities of the American coals have been investigated by Prof. W. R. Johnson, who was commissioned by the United States government for this purpose, and whose report was addressed to the navy department in 1844 (Senate Document No. 386). The results are presented in a condensed form by Prof. Johnson in the American edition of Knapp's "Chemical Technology," the table below being arranged from the more detailed tables contained in his report. It contains 25 varieties of coals,

five from each one of five different classes, succeeded by a summary of the results, presenting a general scale of relative values made up from the averages of the classes. From this it appears that in evaporative power under equal weights the Cumberland class surpasses the anthracite by about 2.3 per cent., and under equal bulks by 1.4 per cent. From single experiments, however, the most water evaporated was with anthracite. The anthracites also surpass the foreign bituminous coals 20 per cent. when we compare equal weights, and 26 per cent. by equal bulks. In freedom from clinker the anthracites stand preëminent; in rapid production of steam when once in action, the Pennsylvania bituminous coals are somewhat superior to all others; and for rapidly getting up steam the foreign bituminous coals are most effective. Column A gives the relative evaporative power of equal weights of coal; B, comparative power of equal bulks of coal; C, relative freedom from tendency to clinker; D, rapidity of action in evaporating water; E, facility of ignition, or readiness with which steam is got up; F, sum of the relative values in the preceding columns.

CLASS OF COALS.	Names of samples.	A.	B.	C.	D.	E.	F.
Cumberland, Md., free-burning bituminous.....	Atkinson's and Templeman's.....	1,000	1,000	282	828	505	3,615
	Easby's "coal in store".....	886	946	451	658	258	3,377
	Easby and Smith's.....	881	908	197	856	829	3,246
	New York and Maryland mining	914	927	111	677	876	3,005
	Neil's.....	892	906	188	877	298	3,096
	Averages.....	982	986	235	755	320	3,248
Anthracites of Pennsylvania....	Beaver Meadow, slope 5.....	993	982	1,000	723	907	3,524
	Forest Improvement, Schuylkill.....	940	985	741	730	150	3,575
	Peach Mountain, Schuylkill.....	945	964	198	901	142	3,150
	Lackawanna.....	915	844	454	779	187	3,209
	Lehigh.....	885	872	555	792	158	3,307
	Averages.....	911	928	595	797	168	3,395
Free-burning bituminous coals of Pennsylvania.....	Queen's run.....	960	918	453	726	667	3,724
	Blossburg.....	908	911	176	996	595	3,558
	Dauphin and Susquehanna.....	878	885	171	768	692	3,287
	Cambria county.....	868	860	172	867	250	3,109
	Lycoming creek.....	883	871	184	706	291	2,885
	Averages.....	887	878	232	892	481	3,299
Highly bituminous coals of Virginia.....	Chesterfield mining company.....	841	722	148	1,000	427	3,187
	Mid-Lothian, screened.....	886	722	150	730	858	2,856
	Creek company's.....	737	692	136	981	299	2,885
	Crouch and Sneed's.....	779	756	112	635	481	2,743
	Tippacanoe.....	724	618	149	875	376	2,749
	Averages.....	798	709	144	844	354	2,872
Foreign bituminous coals.....	Newcastle, England.....	809	776	191	827	595	3,198
	Pictou, N. S., Cunard's sample.....	792	738	97	923	558	3,148
	Sydney, N. S.....	747	669	276	764	424	2,880
	Liverpool, England.....	783	668	823	837	591	3,167
	Scotch.....	649	625	107	847	521	2,749
	Averages.....	746	694	197	844	526	3,027
General scale of relative values, formed from the averages of each class.....	Maryland free-burning coals.....	1,000	1,000	805	880	682	.....
	Pennsylvania anthracites.....	977	956	1,000	898	819	.....
	Pennsylvania free-burning bituminous.....	951	983	890	1,000	914	.....
	Virginia bituminous.....	850	757	912	943	780	.....
	Foreign bituminous.....	601	741	381	948	1,000	.....

His operations were conducted upon a large scale, four trials being usually made in ascertaining the evaporative power of each coal,

and each trial consuming from 800 to 1,200 lbs. The total number of trials was 144, in which 62½ tons were consumed. The object

was particularly to determine what coals were best adapted for steam navigation; and the points of special attention were essentially the same as those to which the attention of the commission afterward appointed by the British government was directed, viz.: 1, the capacity of the coals for raising steam quickly; 2, for raising it abundantly for the quantity consumed; 3, freedom from dense smoke in its combustion; 4, freedom from tendency to crumble in handling; 5, capacity, by reason of its density, of close stowage; and 6, freedom from sulphur. The names and the exact localities of the particular kinds of coal which were employed in these experiments are now in most instances lost; but their composition being preserved in the records of their analyses, the principles established are readily applied to other coals of similar composition.—For further information relating to the subject of fuel, see ANTHRACITE, CHARCOAL, COAL, COKE, GAS, PEAT, and WOOD.

FUENTERRABIA, or *Fontarabia*, a city and port of Spain, in the Basque province of Guipúzcoa, at the mouth of the Bidasoa, on the French frontier; pop. about 3,000. It was formerly well fortified, but the French dismantled it in 1794. It has some manufactures of hempen shoes, linen, cloth, marine stores, and earthenware. It has sustained several sieges, and was the scene of a victory over the Carlists by the auxiliary British legion under Gen. Evans in 1837. During the peninsular war, the Fuenterrabians were reproached with singularly inhospitable treatment of disabled British troops. Milton celebrated it in connection with the rout of Roncesvalles.

FUEROS (from Lat. *forum*, a law court), a term applied in Spanish law to customs, codes, charters, and grants, and to courts and their jurisdiction. The *Fuero Juzgo*, or *Forum Judicum*, is a collection of Visigoth laws, which St. Ferdinand sent to Cordova in 1241, to be observed there as the law of the territory which he had rescued from the Moors. The first printed edition of it is of 1600; the best is that of the academy, in Latin and Spanish (1 vol., Madrid, 1815). The *fueros* or constitutional privileges of the Basque provinces, Guipúzcoa, Álava, Biscay, and Upper Navarre, place them outside of the ordinary administration of the kingdom. Their government is essentially republican, the executive having only the power of nominating the corregidor or chief magistrate, whose nomination has to be confirmed by the junta of the province, a legislative body elected by almost universal suffrage. The inhabitants of these provinces are exempt from all taxes and imposts, except such as they vote themselves, and claim by virtue of their birth the privileges of Spanish nobility. From the remotest antiquity they have maintained their rights against all the dynasties of Spain. In the 13th century the *fueros* were embodied in a written code, which was enlarged and reconfirmed in the reign of the em-

peror Charles V. The *fueros*, suppressed in 1812, were recovered after two insurrections, in the last of which, from 1821 to 1823, the Basques maintained their cause till the French intervention took place. Deprived of them again by Isabella in 1833, they fought for their recovery under Don Carlos till 1839, when the queen, and in 1844 the cortes, guaranteed their enjoyment. (See *Basques*.)

FUERTE, or *Villa del Fuerte*, a town of Mexico, in the state of Sinaloa, on the Fuerte river, about 60 m. from the gulf of California, and 150 m. S. S. E. of Guaymas; pop. about 5,000. It is situated in a delightful plain, and possesses many handsome houses. It is chiefly important as a depot of the transit trade between Guaymas and the interior.—The Rio del Fuerte rises in the Sierra Madre toward the W. confines of Chihuahua, and after flowing about 200 m. in a generally S. W. direction, empties into the gulf of California.

FUGGER, the name of a German princely family, whose founder was JOHANNES, a weaver in Graben, near Augsburg, in the first half of the 14th century, who acquired a large property in lands by commerce in cloths. His son, of the same name, continued the occupation of weaver and cloth merchant, and obtained by marriage the right of citizenship in Augsburg. ANDREAS, eldest son of the latter, was known as "Fugger the Rich." The nephews of the last, ULRICH, GEORG, and JAKOB, born about the middle of the 15th century, covered the Baltic with their commerce, which extended also to Hungary, Italy, and even to India, influenced the affairs of the empire by lending money to the princes, married into the most illustrious families, and were ennobled by the emperor Maximilian I. They built in Tyrol the splendid castle of Fuggerau, embellished the city of Augsburg, and found a new source of wealth by working the mines of the Inn valley. The only heirs of these three brothers were the two sons of Georg, RAIMUND (1489–1585) and ANTON (1493–1560). The emperor Charles V. resorted to them both when pressed for money, yielded to them the privilege of coining, made them counts and princes of the empire, and was lodged in the splendid mansion of Anton when he attended the diet of Augsburg. They established at Augsburg a cabinet of antiquities, a gallery of paintings, and a botanical garden, built the church of Saint Maurice, paid 3,000 crowns to Titian for a few paintings, and collected the two largest libraries that had yet been seen in Germany. Their name was given to a street in Madrid, and "as rich as a Fugger" became a proverb. Upon the death of these two brothers the family divided into numerous lines, and its most important branches at present are the princely houses of Fugger-Kirchberg and Fugger-Babenhausen.

FUGITIVE (Lat. *fugire*, to flee), literally, one who flees away. Under this head might be considered two classes of cases: 1, that of

fugitives from justice, by which is meant those who flee from one jurisdiction to another to escape prosecution or punishment for crime (see EXTRADITION); 2, that of persons fleeing to avoid compulsory labor for others. It was one of the compromises of the constitution of the United States that "no person held to service or labor in one state, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such service or labor may be due." (Art. iv., § 2.) Although the word slave was not here employed, the purpose was to provide for the reclamation of slaves fleeing from their masters; and in 1793 an act was passed by congress to give effect to the provision by means of the arrest of any person claimed as a fugitive from slavery, and his return to the state from which he was found to have fled, after a summary judicial hearing. The repugnance to the institution of slavery on the part of large numbers of people in the northern states rendered this act of little practical value, and another was passed in 1850 with more stringent provisions. Some of these were exceedingly obnoxious, especially that which gave a larger fee to the judicial officer when the person arrested was adjudged to be a slave than when decided to be free, and that which required all persons to assist when called upon in the arrest and return of the person claimed. Although many persons were remanded under this act, the hostility to slavery which was created, or at least intensified by it, probably led to the giving of assistance in a larger number of escapes than had ever been made before, and the act became of little service. A widespread organization to assist fugitives to their liberty became known popularly as the "underground railroad," and a great many persons were aided by it. The act was repealed after the civil war broke out, and the constitutional provision became unimportant after slavery was abolished.

FUGUE (Lat. *fuga*, flight), a species of musical composition in which one voice or part seems to be perpetually flying away from another, whence the name. The principal musical thought of the piece, or the subject, having been performed by one voice or part, is taken up by another, and so on with all the voices or parts, each commencing after the others, and all performing together. The result is an endless pursuit and flight of the same theme by the different parts. Fugues are simple, double, or counter, the last being much the most complicated.

FÜHRICH, Joseph von, a German painter, born at Kratzau, Bohemia, Feb. 9, 1800, died March 13, 1876. He studied in Prague and Rome, and was early associated with Overbeck and other artists in decorating the villa Massimi. In 1834 he settled in Vienna, where he became professor of historical painting. He stood at the head of his profession in his specialty

of Scriptural painting, and executed admirable works for the church of the Viennese suburb Lerchenfeld and for other churches. Among his later productions are the celebrated missal completed in 1868 for the emperor Francis Joseph as a present for the pope; two allegorical cartoons representing spring and autumn (1869); and a series of illustrations of the parable of the prodigal son (1870).

FULDA, a town of Prussia, in the province of Hesse-Nassau, on a river of the same name, here crossed by three bridges, 56 m. N. E. of Frankfort; pop. in 1871, 9,490. It contains a palace and gardens, formerly the residence of the prince-bishops, a number of churches, two convents, an ecclesiastical seminary, and a number of schools. The cathedral is a fine modern building, the fourth which has stood on this site. Of the ancient church it retains only a crypt, in which is the sarcophagus of St. Boniface. There is a library of 50,000 volumes, manufactories of cotton, linen, and woolen, and trade in corn and cattle.—The abbey of Fulda was founded about 750 under the auspices of St. Boniface, became flourishing in the following century through the learning of Rabanus Maurus, who taught at the school connected with the abbey, and obtained from Otho I. in 968 the primacy of all abbeys in Germany. It was raised to the dignity of a bishopric in 1752. This was secularized in 1803, and given to the prince of Orange-Nassau, was annexed to the grand duchy of Berg in 1806, and in 1809 to the principality of Frankfort. After the peace most of the territory was given to the electorate of Hesse, and in 1866 was with the latter annexed to Prussia.

FULHAM, a suburb of London, on the left bank of the Thames, about 6 m. S. W. of St. Paul's cathedral; pop. of the parish in 1871, 23,378. The village of Fulham is connected with Putney by a wooden bridge. Though irregularly built, it contains many fine houses and villas. The most celebrated public building is the palace, which has been the summer residence of the bishop of London since the days of Henry VII. The grounds, nearly 40 acres in extent, are surrounded by a moat over which there are two bridges. The palace is remarkable for its size and historical associations rather than for architectural merit. The ancient parish church of All Saints has a fine Gothic tower and monuments of the bishops of London and other notabilities. There are many nurseries and market gardens, noted especially for the cultivation of asparagus, for the London markets. The population of the parish is rapidly increasing.

FULLER, Andrew, an English Baptist theologian, born at Wicken, Cambridgeshire, Feb. 6, 1754, died at Kettering, Northamptonshire, May 7, 1815. He was settled first at Soham in 1775, and afterward at Kettering in 1782. In 1784 he published a treatise entitled "The Gospel Worthy of all Acceptation," which excited much controversy. In 1799 he composed

his "Dialogues and Letters" (published collectively in 1806). In 1792 he took an active part with Carey and others in establishing the Baptist missionary society, and was appointed its first secretary; and till the close of his life he was constantly engaged in promoting its missions. In 1794 he published "The Calvinistic and Socinian Systems, examined and compared as to their Moral Tendency;" in reply to which Dr. Joshua Toulmin wrote "The Practical Efficacy of the Unitarian Doctrine considered," and Fuller rejoined in "Socinianism Indefensible, on the ground of its Moral Tendency" (1797). He was the author of a great number of other treatises, sermons, &c. His "Complete Works" have been published in 8 vols. 8vo (London, 1824), in 1 vol. imperial 8vo, with a memoir by his son (1852), and in many other editions. The degree of D. D. was conferred on Mr. Fuller by Yale college, and also by the college of New Jersey, but he declined receiving it as unscriptural and incompatible with Christian simplicity.

FULLER, Margaret. See OSSOLI, MARGARET FULLER.

FULLER, Richard, an American clergyman, born in Beaufort, S. C., April 22, 1804, died in Baltimore, Oct. 20, 1876. He graduated at Harvard college in 1824, studied law, and before his 21st year was admitted to the bar of South Carolina. He almost immediately entered upon a large and lucrative practice, and was on the road to professional eminence when he was prostrated by sickness. On his recovery he became a member of the Episcopal church, afterward joined the Baptist denomination, and studied for the ministry. He was ordained in 1833, and took charge of the Beaufort Baptist church. In 1847 he assumed the charge of the seventh Baptist church in Baltimore. He published "Letters concerning the Roman Chancery," being a public correspondence between him and the Roman Catholic Bishop England (Baltimore, 1840); "Correspondence with Dr. Wayland on Domestic Slavery" (1845); "An Argument on Baptism and Close Communion" (1849); volumes of "Sermons" and "Letters;" and, in connection with J. B. Jeter, "The Psalmist," a hymn book in general use in the Baptist denomination.

FULLER, Thomas, an English author, born at Aldwinckle, Northamptonshire, in June, 1608, died Aug. 15, 1661. He was educated at Queen's college, Cambridge, won the highest university honors, received the living of St. Benet's, Cambridge, where he exhibited great eloquence as a preacher, and was also made a prebendary of Salisbury. His first publication was a poem entitled "David's Hainous Sinne, heartie Repentance, heavey Punishment" (London, 1631). He was soon after presented to the rectory of Broad Windsor, Dorsetshire, where he prosecuted several works that he had planned at Cambridge. After seven years he removed to London, where his fame for pulpit eloquence secured for him the lectureship of

the Savoy, and he published his "Historie of the Holy Warre" (Cambridge, 1639). In 1640 he was a member of the convocation assembled in Henry VII.'s chapel, Westminster, to make canons for the better government of the church, of whose proceedings he gives an interesting account in his "Church History." After the outbreak of the civil war he identified himself with the royal cause, and obtained a chaplaincy in the army under Sir Ralph Hopton. He improved the leisure which this position gave him, and the facilities presented by the marches and counter-marches through the country, in collecting by an extensive correspondence and personal inquiries the materials for his "Worthies of England." He was besieged at Basing House in 1644 with a small party of royalists, but animated the garrison to so vigorous a defence that the parliamentary commander was obliged to retire with considerable loss. Taking refuge in Exeter on the defeat of Hopton in 1645, he preached constantly to the citizens till its surrender in April, 1646, and published there his "Good Thoughts in Bad Times" (1645). His "Good Thoughts in Worse Times" appeared in 1646, after his return to London, and he published a new edition with the "Second Century of Good Thoughts in Bad Times" (1647); in 1660 he completed the series with "Mixt Contemplations in Better Times." He continued to preach and to publish tracts and sermons, notwithstanding "it had been the pleasure of the present authority to make him mute," and notwithstanding Cromwell's prohibition of all persons from preaching or teaching schools who had been adherents of the late king. In 1648 he became rector of Waltham abbey in Essex, and in 1658 chaplain to Lord Berkeley and rector of Cranford. Shortly before the restoration he was reinstated in his lectureship at the Savoy, and after that event was chosen chaplain extraordinary to the king, and regained the prebend of Salisbury. A bishopric was expected for him when he died. He was buried in his church at Cranford, in the chancel of which his monument still remains. His "Holy and Profane State, a collection of Characters, Moral Essays, and Lives, Ancient, Foreign, and Domestic" (Cambridge, 1642), proposing examples for our imitation and abhorrence, is one of his best productions, and fully exhibits his sagacity of thought and pithiness of style. His "Church History of Britain, from the Birth of Jesus Christ until the year MDCXLVIII." (London, 1656), though abounding in jokes, quibbles, dedications, anecdotes, and curious and irrelevant learning, is one of the most remarkable works in the language for wit, piety, pathos, and imagination. The "History of the Worthies of England," a collection of eccentric biographies, published posthumously (London, 1662), has been more generally read than any other of his works, and abounds in gossip, admirably told stories, curious details, and witty and excellent re-

flections. The style of all his writings is extremely quaint and idiomatic, in short and simple sentences, and singularly free from the pedantry of his time.

FULLERS' EARTH, an unctuous sort of clay, much of it kaolinite, useful in fulling cloth, from its property, common to aluminous earths, of absorbing oil and grease. That variety of clay is preferred which falls to pieces when put in water, making a slight crackling sound. Its colors are various shades of yellowish, greenish, bluish, brown, and gray; lustre dull, but appears greasy when rubbed. Its composition is given by Dr. Ure as follows: silica 53, alumina 10, peroxide of iron 9.75, magnesia 1.25, lime 0.5, water 24, potash a trace. Dr. Thomson found silica 44, alumina 23.06, protoxide of iron 2, magnesia 2, lime 4.08, water 24.95. It is not now esteemed of so much value as formerly, soap having taken its place. In England it used to be so highly valued that its exportation was prohibited. When used, it was first dried by the sun or by fire, and then thrown into cold water. The powder thus formed was sorted by washing into coarse and fine qualities, the former of which were applied to inferior, the latter to finer cloths.

FULLERTON, Lady Georgiana Charlotte, an English authoress, born Sept. 23, 1812. She is the daughter of the first earl of Granville, and was married in 1833 to Capt. Alexander George Fullerton. Her first publication, a novel entitled "Ellen Middleton," appeared in 1844, and was succeeded within a few years by "Grantley Manor." Both works exhibit constructive skill and an analysis of character of no mean order. "Lady-Bird," published in 1852, after her conversion to the Roman Catholic church, is a narrative of her religious struggles. From this time she devoted her pen to the glorification of her church, and published a number of romances on saints, missions, and conversions; among them, "Constance Sherwood" (1865), depicting the sufferings of the Catholics under Elizabeth; "A Stormy Life" (1867), representing Henry VI. as a martyr-saint; "Hespers of the Holy Souls" (1868); and "Mrs. Gerald's Niece" (1869). She has also published works in French, as *La comtesse de Bonneval, Histoire du temps de Louis XIV.* (1857), and *Rose Loblanco* (1860).

FULLING, also called **MILLING**, the operation of removing greasy matters from woollen goods, and of giving to them a more compact texture by causing the fibres to entangle themselves more closely together, as in the process of felting. Fulling mills are ancient inventions, the process probably having been applied to the first woven fabrics, as felting must already have been then known. Cloths brought to the fulling mills contain the oil which was applied to the fibre in weaving. The first process to which they are subjected is called scouring or braying. This is effected by placing the rolls in troughs so arranged that they can retain the detergent liquid, as, first,

stale urine and hogs' dung, subsequently urine alone, and again fullers' earth and water, while heavy oaken mallets or pounders slide down with force into one end of the troughs and mash and roll over the folds of cloth. The pounders are lifted by revolving cams, and kept in action for hours together, one to each trough. The oil is absorbed by the clay, and both are washed off by the water. The fulling is properly a second process performed in the same machines with the use of soap applied liberally in solution. The stampers are better made of polished iron, and the operation is facilitated, with economy of soap, by keeping the trough filled with hot steam. Cloth is also fulled in what is called the fulling machine without stamping, the cloth being pushed in a succession of folds through a low trough, the top of which is made by weights to press upon these folds and resist their progress through. The soap is washed out after the fulling, and the nap is raised by teasing. To full a piece of ordinary broadcloth it has been customary to allow from 60 to 65 hours, and 11 lbs. of soap; the shrinkage in width is from 12 quarters to 7, and in length from 54 yards to 40.

FULMAR, a species of large petrel of the genus *procellaria* (Linn.) or *fulmarus* (Leach). This bird (*P. glacialis*, Linn.) is about 20 in. long, with an alar extent of 3 ft. and a weight of 1½ lb.; the bill, iris, and feet are yellow, the latter with a greenish tinge; the head, neck, and lower parts pure white; back and wings light grayish blue, palest on rump, and the tail bluish white; quills and their coverts blackish brown; a black spot before and partly over the eyes. It is abundant in the arctic seas, where it attends the whale ships, seizing the pieces of blubber which fall into the water,



Fulmar (*Procellaria glacialis*).

and often boldly helping itself from the carcass while the men are at work. It breeds in the northern regions, coming down on the American coast as far as Long Island in the autumn, winter, and early spring, and is pretty common on the banks of Newfoundland, where

it feeds on the garbage rejected by the cod fishers. It also breeds in the island of St. Kilda, on the W. coast of Scotland, where the inhabitants eat the flesh and eggs, preserve the down and feathers, and collect oil by boiling down the young, which is used for burning and for medicinal purposes. The eggs are pure white, with very brittle shells, regularly ovate, $2\frac{1}{2}$ by 2 in., and are obtained with great difficulty and danger, as the nests are in the crevices of nearly perpendicular rocks. It is a bold and powerful bird, a rapid and graceful flyer, an excellent swimmer, but awkward on land; it rarely dives; it is hardy, difficult to kill from the thickness of its plumage, and can inflict severe wounds with the bill. Several other large species of petrels are also called fulmar. (See PETREL.)

FULMINATES. See EXPLOSIVES.

FULMINIC ACID (Lat. *fulmen*, lightning), one of the isomeric modifications of cyanic acid, represented by the formula $Cy_2H_2O_2$. Its compounds are distinguished for their explosive character, in which they differ from those of cyanic acid. All attempts to obtain it isolated have failed, from its tendency to instantaneous decomposition with explosion.

FULTON, the name of eight counties in the United States. I. An E. county of New York, drained by Sacandaga river and East Canada creek; area about 530 sq. m.; pop. in 1870, 27,064. The soil is fertile and the surface uneven, with several mountainous elevations. The New York Central railroad passes near its S. boundary. The chief productions in 1870 were 4,530 bushels of wheat, 12,983 of rye, 107,428 of Indian corn, 303,914 of oats, 62,178 of buckwheat, 200,949 of potatoes, 54,862 tons of hay, 255,473 lbs. of cheese, 667,152 of butter, 56,761 of wool, and 72,503 of hops. There were 4,001 horses, 11,197 milch cows, 7,327 other cattle, 16,099 sheep, and 5,210 swine; 118 manufactories of gloves and mittens, 14 of dressed skins, 9 of paper and wood boxes, 8 of cheese, 1 of hardware, 10 of paper, 2 of woolen goods, 7 flour mills, 23 saw mills, 1 planing mill, 15 tanneries, and 2 currying establishments. Capital, Johnstown. II. A S. county of Pennsylvania, bordering on Maryland, and drained by Conoloway and Licking creeks, tributaries of the Potomac; area, 880 sq. m.; pop. in 1870, 9,860. Its E. boundary is formed by Cove mountain; Sideling hill lies on its W. frontier, and between the two are fertile valleys. The uplands produce timber, which is one of the principal staples. The chief productions in 1870 were 102,144 bushels of wheat, 43,202 of rye, 142,176 of Indian corn, 103,705 of oats, 40,081 of potatoes, 9,184 tons of hay, and 171,741 lbs. of butter. There were 2,945 horses, 3,200 milch cows, 4,500 other cattle, 6,879 sheep, and 6,906 swine; 3 flour mills, and 7 tanneries. Capital, McConnellsburg. III. A N. W. county of Georgia, bounded N. W. by Chattahoochee river; area, 200 sq. m.; pop. in 1870, 33,446, of whom 15,282 were colored.

The surface is diversified and the soil fertile. Numerous railroads centre at Atlanta. The chief productions in 1870 were 24,604 bushels of wheat, 134,996 of Indian corn, 10,207 of oats, 10,002 of Irish and 81,598 of sweet potatoes, and 866 bales of cotton. There were 414 horses, 716 mules and asses, 1,204 milch cows, 2,711 other cattle, 727 sheep, 6,177 swine, and many manufacturing establishments, chiefly at Atlanta, the capital, which is also the capital of the state. IV. A N. county of Arkansas, bordering on Missouri, and drained by the N. fork of White river; area, 860 sq. m.; pop. in 1870, 4,843, of whom 85 were colored. It has a hilly surface and a good soil, suitable for grain and pasturage. The chief productions in 1870 were 18,498 bushels of wheat, 141,925 of Indian corn, 10,598 of oats, 276 bales of cotton, and 22,750 lbs. of tobacco. There were 1,818 horses, 1,882 milch cows, 8,520 other cattle, 8,711 sheep, and 7,859 swine. Capital, Pilot Hill. V. A S. W. county of Kentucky, bounded S. by Tennessee, and separated from Missouri on the W. and N. W. by the Mississippi river; area about 200 sq. m.; pop. in 1870, 6,161, of whom 937 were colored. The surface is somewhat diversified, and the soil generally fertile. It is traversed by the Mobile and Ohio and the Nashville and Northwestern railroads. The chief productions in 1870 were 40,844 bushels of wheat, 438,014 of Indian corn, and 888,686 lbs. of tobacco. There were 1,298 horses, 1,210 milch cows, 1,826 other cattle, 3,790 sheep, and 12,428 swine. Capital, Hickman. VI. A N. W. county of Ohio, bordering on Michigan, drained by Tiffin's river, a branch of the Maumee; area about 337 sq. m.; pop. in 1870, 17,789. It has an undulating surface and a fertile soil, suitable for grain and pasturage. It is intersected by the Lake Shore and Michigan Southern railroad. The chief productions in 1870 were 238,206 bushels of wheat, 199,725 of Indian corn, 176,248 of oats, 106,686 of potatoes, 23,887 tons of hay, 113,555 lbs. of cheese, 512,290 of butter, and 150,424 of wool. There were 4,924 horses, 6,048 milch cows, 6,805 other cattle, 33,353 sheep, and 10,182 swine; 9 manufactories of carriages and wagons, 2 of cheese, 4 of barrels, &c., 5 of saddlery and harness, 21 saw mills, 4 tanneries, and 7 flour mills. Capital, Ottokee. VII. A N. county of Indiana, drained by Tippecanoe river; area, 866 sq. m.; pop. in 1870, 12,726. It has a level surface, occupied partly by prairies, partly by oak openings, and partly by forests. Iron is found in some localities, and the streams furnish abundant water power. The soil is mostly of good quality. The Chicago, Cincinnati, and Louisville railroad passes through it. The chief productions in 1870 were 278,145 bushels of wheat, 142,684 of Indian corn, 38,909 of oats, 41,897 of potatoes, 13,246 tons of hay, 229,108 lbs. of butter, and 45,754 of wool. There were 4,700 horses, 3,817 milch cows, 4,924 other cattle, 14,940 sheep, and 10,533 swine; 2 manufactories of

carriages and wagons, 2 of woollen goods, 1 of boots and shoes, 6 flour mills, and 14 saw mills. Capital, Rochester. VIII. A W. county of Illinois, bounded S. E. by the Illinois river, and drained by Spoon river; area, 870 sq. m.; pop. in 1870, 88,291. The Illinois river, which is here navigable, is the channel of a large export trade. Spoon river is valuable for water power, and nearly all the streams are bordered by a good growth of timber. The soil of the county is rich, and the surface undulating, occupied partly by prairies and partly by woodlands. Coal is found in abundance. The Toledo, Peoria, and Warsaw railroad, and a branch of the Chicago, Burlington, and Quincy railroad pass through it. The chief productions in 1870 were 417,599 bushels of wheat, 181,711 of rye, 1,508,768 of Indian corn, 261,390 of oats, 96,207 of potatoes, 27,545 tons of hay, 458,873 lbs. of butter, and 105,259 of wool. There were 12,825 horses, 8,510 milch cows, 15,949 other cattle, 2,078 sheep, and 57,965 swine; 8 manufactories of agricultural implements, 15 of carriages and wagons, 3 of boots and shoes, 6 of furniture, 2 of hubs and wagon material, 11 of saddlery and harness, 3 of woollen goods, 10 saw mills, and 12 flour mills. Capital, Lewistown.

FULTON. I. A village of Oswego co., New York, on the E. bank of the Oswego river, about 10 m. S. S. E. of Oswego, and on the Oswego canal, and the Oswego and Syracuse and New York and Oswego Midland railroads; pop. in 1870, 3,507. It is chiefly noted for its manufactories. The principal establishments are machine shops, iron foundries, a planing mill, flour mills, woollen mills, and manufactories of pails, tubs, paper, boats, sashes, doors, and blinds, bedsteads, lime, potash, edge tools, &c. There are marble yards, many fine stores, two national banks, and two weekly newspapers. The Falley academy (Presbyterian) in 1872 had 5 instructors and 83 pupils. II. A town and the capital of Callaway co., Missouri, on a branch of the Chicago and Alton railroad, 12 m. from the Missouri river, and 20 m. N. E. of Jefferson City; pop. in 1870, 1,585, of whom 480 were colored. It is the seat of the state asylum for the deaf and dumb, and of the state lunatic asylum, which occupies a beautiful edifice, five stories high and 210 ft. long, on a plot of 460 acres. Westminster college (Presbyterian) in 1872 had 12 professors and instructors, 101 students, and a library of 2,500 volumes. The town contains a national bank, three weekly newspapers, and manufactories of earthenware.

FULTON, Robert, an American inventor, born at Little Britain, Lancaster co., Pa., in 1765, died in New York, Feb. 24, 1815. When about three years old he lost his father. He received a common school education, went to Philadelphia at the age of 17, and became a miniature painter. Mechanical pursuits, however, mingled with those of the artist. Before attaining his majority he had laid by a sum

sufficient to buy a small farm, upon which he placed his mother, and soon afterward went to London to study under West, with whom he remained several years. Afterward he became acquainted with the duke of Bridgewater, at whose instance he adopted the profession of civil engineer. He had in the mean time become acquainted with Earl Stanhope, who was engaged on a scheme of steam navigation. In 1793 Fulton wrote to him, suggesting some of the views which he afterward reduced to practice on the Hudson. At Birmingham he was brought into communication with Watt, who had just succeeded in his great improvement of the steam engine, with the structure of which Fulton made himself familiar. During his residence here he devised an improved mill for sawing marble, for which he received a vote of thanks and an honorary medal from the British society for the promotion of arts and commerce. To this period also are referred his patented machines for spinning flax and for making ropes, and the invention of an excavator for scooping out the channels of canals and aqueducts. In 1796 he published in London his treatise on the improvement of canal navigation. Having obtained a patent in England for canal improvements, Fulton went to France with the view of introducing them there, but his attention was soon diverted to other objects. In 1797 he took up his residence at Paris, where he resided for seven years with Joel Barlow, and superintended the illustration of his "Columbiad." At this time he devised the submarine boat, afterward styled a nautilus, connected with which were submarine bombs, afterward known as torpedoes. This invention he offered several times to the French government, and once to the Dutch ambassador at Paris, without exciting their favorable attention. Negotiations were subsequently opened with him by the British government, which induced him to visit London in May, 1804. A commission, at the head of which was Sir Joseph Banks, reported that the submarine boat was impracticable. In October, 1805, he was permitted to experiment on a brig of 200 tons burden with a carcass of 170 lbs. of powder. In 15 minutes from the application of the carcass the explosion took place; the brig, according to Fulton's account, made no more resistance than a bag of feathers, and went to pieces like a shattered egg shell. Notwithstanding this success Fulton was disappointed in his hopes of government patronage, and at length embarked for his native country. He reached New York in December, 1806, and in the following month went to Washington, where his models and drawings made a favorable impression, and a sum was appropriated to defray the cost of experiments with the torpedoes. The probability of a rupture with England, consequent on the affair of the Leopard and Chesapeake, made the summer of 1807 propitious to his project, and on July 20 he decomposed a large hulk brig in the

harbor of New York with a torpedo containing 70 lbs. of powder. In 1810 he again visited Washington, and explained some improvements in his plans to Jefferson, Madison, and a number of members of congress. So successful was he in his explanations that congress appropriated \$5,000 for further experiments, to be prosecuted under the direction of the navy department. The sloop of war Argus had been prepared, under the orders of Commodore Rodgers, to defend herself against Fulton's attack, which proved unsuccessful. Various reports were made by the commissioners, but Rodgers pronounced Fulton's system to be impracticable. Fulton still believed in it, but he had engaged in other schemes which left him no time to continue his experiments. While residing in Paris he had become acquainted with Robert R. Livingston, then United States minister to France, who had previously been connected with Nicholas Roosevelt and John Stevens in steamboat experiments at home. He now entered into the views of Fulton, and offered to provide funds for an experiment, and to contract for the introduction of the new method, if successful, into the United States. In 1798 an act was passed by the legislature of New York, repealing the act of 1787 in favor of John Fitch, and transferring to Livingston the exclusive privilege of navigating the waters of the state by steam, on condition that he should within a twelvemonth give proof of his having built a boat of 20 tons capable of a mean progress in the Hudson river of four miles an hour, and at no time omit for one year to have a boat of this construction plying between Albany and New York. This act was from time to time continued, and Fulton was finally included within its provisions. Late in 1803 Fulton constructed a working model of his intended boat, and at the same time commenced building a vessel 66 ft. in length and 8 ft. in width. When finished, it did not move with the speed that was expected. In the same year, however, he sent an order to Watt and Boulton for a steam engine to propel a boat of large size, which was completed and reached New York in 1806. Fulton had meanwhile informed himself of everything that had been attempted in steam navigation in Europe and the United States. He planned for the new machinery a boat that was completed and fitted in 1807 and named the Clermont. Its progress through the waters of the Hudson is stated at five miles an hour. In the course of the ensuing winter it was enlarged to a boat of 140 ft. keel and 16½ ft. beam. So completely was the utility of the invention established that the legislature extended the exclusive privilege of Livingston and Fulton five years for every additional boat, provided the whole term should not exceed 30 years; and in 1808 passed another act subjecting to forfeiture any vessel propelled by steam which should enter the waters of the state without their license. His second large boat on the

Hudson was the Car of Neptune, built in 1807. In 1809 Fulton obtained his first patent from the United States; and in 1811 he took out a second patent for some improvement in his boats and machinery. Meanwhile the power of the legislature to grant the steamboat monopoly was denied, and a company was formed at Albany to establish another line of steam passage boats on the Hudson, between that city and New York. The state grantees filed a bill in equity, and prayed for an injunction, which was refused on the ground that the act of the state legislature was repugnant to the constitution of the United States and against common right. This decree was reversed by the court of errors, and a compromise was effected with the Albany company by an assignment to them of a right to employ steam on the waters of Lake Champlain. Other litigation followed, the result of which was that the waters of the state remained in the exclusive possession of Fulton and his partner during the lifetime of the former. A similar controversy arose in New Jersey, which was also compromised. Pending these controversies, Fulton constructed ferry boats to run between New York and New Jersey, one for a Brooklyn company, a boat for Long Island sound, five for the Hudson river, and several boats for steamboat companies in different parts of the United States, some of them for the Ohio and Mississippi rivers. In 1811 he was made one of the commissioners appointed by the legislature to explore the route of an inland navigation from the Hudson river to the lakes. In 1814 congress authorized the president to build and employ one or more floating batteries for coast defence, and Fulton was appointed the engineer. He commenced immediately the construction of a war steamer, which was launched within four months, and was styled by the constructor the Demologos, though it was afterward named Fulton the First. This first war steamer was a heavy and unwieldy mass, which obtained a speed against the current of some 2½ miles an hour; but as the pioneer of the steam navies of the world it was regarded as a marvel, and as a most formidable engine of defence. The war having terminated before her completion, she was taken to the navy yard at Brooklyn, where she was used as a receiving ship till June 4, 1829, when she was accidentally blown up. While engaged in the construction of this war steamer, Fulton was employed by the president upon an improved modification of his submarine boat, which was arrested by his death. The "Life of Robert Fulton," by C. D. Colden, was published in 1817. His life has also been written by James Renwick, in Sparks's "American Biography."

FULVIA, a Roman lady, born about 80, died about 40 B. C. She was married successively to Clodius, Curio, and Mark Antony, and had part in arranging the fearful proscription of the second triumvirate. When the head of Cicero was brought to her, she pierced the tongue

with her needle. To withdraw Antony from Egypt, where the charms of Cleopatra detained him, and to take revenge upon Octavius, who had affronted her by repudiating his wife, her daughter Clodia, she excited her brother-in-law Lucius Antonius to make war upon Octavius. The war was unsuccessful, and Fulvia escaped to Greece, was reproached by Antony, who met her at Athens, and died of shame and regret at Sicyon.

FUMBINA. See ADAMAWA.

FUNCHAL, a seaport town and the capital of the island of Madeira, on the S. E. coast, in lat. 32° 37' N., lon. 16° 54' 30" W.; pop. about 25,000. It stands on a wide shallow bay, embraced by the steep promontories of Ponta da Cruz on the west and Cape Garajão on the east, and enclosed in the rear by broken volcanic

ridges. The town is defended by four forts. It presents a picturesque appearance, the white walls of the houses, which are mostly of stone, contrasting with the never failing foliage of the gardens. The streets are narrow, with steep ascents, and paved with small stones. Travelling and the transfer of merchandise are done on sleds, drawn by oxen. There are no public buildings of much elegance, and the numerous churches and convents have no architectural beauty. The cathedral, however, deserves mention. The harbor, which is covered by the forts, is indifferent. Fresh meat and poultry are sold at high prices, but the richest fruits, excellent fish, and vegetables may be had cheaply in abundance. The town is resorted to by invalids from all countries on account of its delightful climate. The mean temperature

Funchal.

is about 68° F., and the difference between the hottest and coldest months (August and February) averages only 10°. The imports for 1871 amounted to \$1,006,373; the exports to \$796,800, of which wine constituted \$683,000, nearly the whole of which was sent to Great Britain and the British colonies. The entrances to the port were 266 steamers and 205 sailing vessels. The trade is chiefly in the hands of the English residents.

FUNDY, Bay of, a deep inlet of the Atlantic, separating the Canadian provinces of Nova Scotia and New Brunswick. It is about 170 m. long, and from 80 to 50 m. wide. From its mouth, between the S. W. extremity of Nova Scotia and the easternmost point of Maine, its coasts trend N. E. until near its upper extremity it branches into two inlets; the northern, called Chignecto bay, is about 80 m. long and 8 m. broad; the southern bears the name of

Minas channel, and opens into Minas basin in Nova Scotia. At St. John, N. B., situated at the mouth of the river St. John, on the N. coast, the bay is 36 m. wide, and it continues of nearly uniform width from that point to its branching. It is deep, but difficult of navigation. It is remarkable for its extraordinary tides, which rush up from the sea with such rapidity as sometimes to overtake swine feeding on shellfish on the shores, and rise in Minas basin 40 ft., and in Chignecto channel 60 ft. Grand Manan, Campo Bello, and Long islands lie at the mouth of the bay, which receives the rivers St. John and St. Croix.

FÜNEN (Dan. *Fyen*), an island of Denmark, having on the N. the S. W. prolongation of the Cattegat, E. the Great Belt, W. the Little Belt, and S. the archipelago connecting the two Belts; area about 1,160 sq. m.; pop. in 1870, 217,244, including the inhabitants of a

number of small islands which come under its administration. It is the largest of the Danish isles after Seeland, and forms with the islands W. of the Great Belt, including Langeland and Arrø, a circle of the kingdom. The coast is not very elevated, but is in general rugged and steep, and much indented by bays and arms of the sea. The interior toward the west is somewhat hilly; in every other direction it is composed of large and fruitful plains, which produce abundant crops of corn. The largest stream in the island is the Odense Aa, which has a northerly course of 36 m., and discharges into the Odense fiord, about 9 m. long, and from 1½ to nearly 5 m. wide. A canal, navigable by vessels drawing 8 ft., connects the town of Odense with the Odense fiord. The largest lake is the Arreskov, which is about 7 m. in circuit, and abounds in fish. Fünen is divided into the bailiwicks of Odense, which contains the capital, of the same name, and Svendborg.

FUNERAL RITES. See BURIAL.

FUNES, Gregorio, an Argentine historian, born in Cordova, died there in 1820. He was educated at Cordova, entered holy orders, became dean in the cathedral church, and attempted to introduce into the university the study of the higher mathematics, the law of nations, the modern languages, music, and drawing. During the revolutionary tumults the possessions of his father were confiscated by the royalist party. He wrote *Ensayo de la historia civil del Paraguay, Buenos Ayres y Tucuman* (3 vols. small 4to, Buenos Ayres, 1816 *et seq.*), which contains an excellent epitome of the annals of a vast territory, of which but little was yet known in Europe.

FÜNFKIRCHEN (five churches; in Hungarian *Pécs*, which in the language of the surrounding Slavic tribes means five), a town of Hungary, capital of the county of Baranya, 105 m. S. S. W. of Buda; pop. in 1870, 17,447. It is surrounded by rich vineyards, in the vicinity of mineral springs, and is one of the pleasantest towns of Hungary. It is the seat of a Roman Catholic bishop, and has an old Gothic cathedral, built on the site of a Roman castle, two monasteries, a public library, several schools and hospitals, and a theatre. The population consists chiefly of Magyars, but the Slavic and German inhabitants are also numerous. The town has a large trade in coal, alum, vitriol, wine, grain, tobacco, rape seed, wool, and other products of the neighboring country.—Fünfkirchen is supposed to be the Colonia Serbinum of the Romans. In the time of Hungarian independence it was larger and much more important than now. History mentions that 2,000 of its students marched out to the battle field of Mohács, where the Hungarians were defeated by the Turks under Solyman, Aug. 29, 1526. This sultan passed some time at Fünfkirchen, during the siege of the fortress of Sziget, and was so delighted with the place that he called it a paradise on earth. It re-

mained in the hands of the Mussulmans from 1543 till 1686.

FUNGI (Gr. *σπόγγος*, a sponge), an extensive family of cryptogamic plants, generally known under the names of mushrooms, toadstools, rusts, smuts, bunt, and mildews. With rare exceptions, they are parasitic plants, growing upon and drawing their nourishment (or at least a part of it) from the substance of the object they infest. Fungi occur in all parts of the globe, finding their maximum in the moist temperate zones; abounding in a climate like that of Sweden, which has produced more species upon a given area than any other known locality, except perhaps the southern United States. They are found wherever there is decaying vegetation, upon which they feed; they often prey upon living tissues, which they destroy by their attacks; their vegetating fibres are of such extreme minuteness that they penetrate the hardest woods, and powerfully hasten their decay. Nothing of vegetable origin is free from their ravages when exposed to influences favorable to their growth. They are found also on animal dejections, on insects, whose death they cause, on the human skin, and even on bare stones, on iron which was in a forge a few hours before, on lead, and on chemical solutions. The disease in silkworms is caused by a mould (*botrytis bassiana*). The flies found adhering to windows in autumn, fixed by the proboscis, are destroyed by a mould (*sporendonema muscæ*), which produces the little white rings between the abdominal segments and discharges its seed upon the glass around like a little cloud. The celebrated caterpillar fungus of New Zealand (*cordyceps Robertsi*), which infests the caterpillar of *hepialus virescens*, is a remarkable instance. American caterpillars are destroyed by other species. The larva of the common May beetle (*lachnosterna quercina*), which passes three years of its destructive life under ground, is sometimes attacked by a fungus which soon causes its death. *Orygena equina* grows on the hoofs and horns of animals. Some of the microscopic species cause cutaneous disorders in the human system, and others have been found in the brains of birds. (See EPIPHYTES.)—Notwithstanding the long time which has been given to the study of fungi, there is no class of organized structures so little known. Their microscopic character, their abnormal growths, their polymorphic forms, have baffled the researches of the closest observers. It is only within a comparatively short time that an approach has been made to a clear insight into their laws of growth and reproduction. Some even now deem them to be of spontaneous or chemical origin, an opinion which their sudden appearance in vast numbers after a long rest, and their occurrence in closed cavities, have tended to establish. But this idea has been clearly disproved. That they are perfect plants, growing from and reproducing bodies analogous to seeds, is too firmly established to be questioned. When

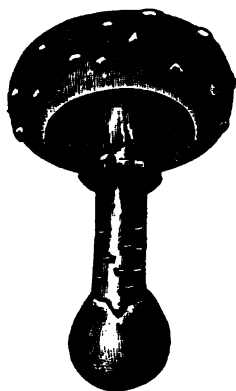
we learn that a single plant produces millions of these reproductive bodies, so small that they float on the air scarcely influenced by the force of gravity, that they may remain an indefinite period inert, and be called into sudden vitality by atmospheric changes favorable to their germination, their sudden appearance can be readily understood. They have been traced through their metamorphoses. The infinitesimally small spore has been watched in its growth into a perfect plant; and one such observation, unquestionably made, is positive proof of their being perfect plants, having a development following certain laws.—Fungi are of purely cellular growth. They form no woody fibre like flowering plants, though many become corky, woody, and horny in the course of their growth, nor do they form chlorophyl in their tissues. They consist of mere aggregations of homogeneous cells, but exhibit a wonderful variety of external forms. Their earliest vegetation is a prolongation of the membranes of their spores, a name given to their reproductive seminal dust, which, though performing the office of seeds, differs from true seeds in being mere individual cells. From these arises a delicate, minute, webby growth, called the *mycelium*, which is the true vegetation of the plant, and which gives rise to the reproductive bodies at once, or builds up a receptacle which contains them. It is this mycelium which penetrates and destroys the object on which it is parasitic. It is made up of radiating and intertwining fibres formed of rows of cells placed end to end. These are in many instances so minute that they easily traverse the tissues of living plants and the pores of solid wood. From this mycelium grow the spores, which in their simplest form consist of the terminal cell or cells, which drop off to form new plants. They are of the extremest minuteness, appearing to the eye like a mere cloud of impalpable powder. As we rise in the scale, special branches and processes are formed to bear the spores, either singly or in groups. Still more complex forms build up a special organ called the *peridium*, within which the spores arise contained in little sacs termed *asci*. The large fleshy growths met with in the woods or on trees are processes belonging properly to the reproduction and not the vegetation of the plant. They are very disproportionately large compared with the mycelium, and consist of a main stem called a *stipe* and an expanded top called a *pileus*, on which these spores are borne in various ways, on gills, ribs, prickles, &c. The mycelium is sometimes reduced to a mere trace of evanescent, floccose growth; while the reproductive body becomes a fleshy mass, several pounds in weight. But the spores are always minute, being sometimes only $\frac{1}{100}$ of an inch in diameter.—Fungi occupy an intermediate position between algae and lichens, into which orders they gradually merge at different points. Indeed, so nice is the distinction at times, that some systematists have reduced lichens to a

suborder of fungi. They differ from lichens mainly in deriving their sustenance from the object on which they grow (though this has exceptions), in not producing a foliaceous thallus, and in not forming green chlorophyl; from algae, in being aerial, not aquatic, and in deriving their nourishment from their matrix and not from the surrounding medium. Those species of fungi which are found in fluids, such as the yeast and vinegar plants, are now proved to be merely submerged mycelia of certain moulds (*penicillium*), which do not attain their perfect stage until they reach the air. Their propagation in fluids is due to a power the mycelium possesses of retaining its vitality under a variety of circumstances, of suffering division and enduring extremes of temperature. Besides this, it has a propagating power analogous to that of budding. In some aerial forms it goes on reproducing itself in peculiar ways, and rarely reaching the normal or perfect ascigerous fructification. For this reason many species have been thought to be distinct plants when they are merely arrested stages of growth of one single species. Some aerial forms never reach a further growth than a compact, dense mass of mycelium. Oak trees sometimes contain a solid mass of a leathery texture (*xylostroma giganteum*), which never advances beyond that stage. The genera *sclerotium* and *rhisomorpha*, with their so-called species, are mere compact bodies of mycelium, which have in some instances been artificially forced to develop themselves, and have produced plants of widely different structure. The ergots of grain are the ovary arrested in its proper development and transformed into a peculiar growth by the presence in its tissues of a minute fungus. Tulasne and others have watched their development into species of *cordyceps*. These forms remain constantly arrested; but very many of those which under favorable circumstances reach perfection remain similarly checked, and confuse the student with their multiple forms. This has caused the naming of hosts of species which are merely forms of others. There is no branch of science whose synonymy is more burdensome. It is almost a hopeless task to attempt to identify the species of authors by description alone, the plant itself being necessary for comparison. Long and continued observations are required to determine and connect the many forms which a single fungus may assume in the course of its existence.—Few objects in nature exhibit more gorgeous colors. The larger fleshy forms present an endless variety of graduated tints. Some of the *boleti* exhibit on being broken a remarkable change of color, the white or yellowish hue of the interior changing instantly to a vivid blue. This is supposed by Prof. Robinson to be due to a molecular and not to a chemical change. Their texture is as variable as their color. Some are almost fluid, others fleshy, papery, leathery, corky, or hard and horny. Their size is equally various, from

mere specks to masses some feet in girth. Their rapid growth is astonishing. Puff-balls sometimes grow 6 in. in diameter in a night. Masses of paper pulp thrown out hot from a vat have been found within 24 hours filled and swollen with a species of *agaricus*. Schweinitz records the growth of a species of *athalium* found on a piece of iron which was heated the night before in a forge. Some of the ephemeral *coprini* grow up in a night and melt away in the morning sun. Other species, like the *polypori*, grow very slowly and add a new layer every year, covering that of the previous season. Their expansive force in growing is very great. Notwithstanding their soft, yielding texture, agarics are able to raise heavy stones under which they spring up; Bulliard tells of a *phallus* which burst a glass vessel in which it had been confined; and a case came under the writer's observation in which a puff-ball broke up through an asphalt walk that had been long established and well hardened. Their sudden occurrence over wide districts depends upon peculiar states of the atmosphere favorable to the development of the spores. They generally appear in the greatest abundance in moist autumn weather, though some are found wherever there is moisture. Some depend so much on peculiar states of the atmosphere that they appear suddenly and then disappear for a while. The pustular forms, however, which abound on the dead bark of trees, shrubs, old stumps, and fallen twigs, are more durable from their more solid structure. Some species of *agaricus* possess a remarkable luminosity, and certain *rhizomorpha* growing in mines shed a phosphorescent light of extreme brilliancy. Fungi differ from flowering plants in their chemical influence upon the air. They absorb oxygen and exhale carbonic acid, performing the same office in this respect as animals, which they most resemble in chemical composition, in being highly azotized. The odors they emit in decay are more like putrescent animal than vegetable matter. The fleshy sorts generally possess a peculiar earthy odor, but some species of *phallus* and *clathrus* emit a most intolerably offensive stench, which will render a close apartment untenable. Others, on the contrary, are very agreeable to the smell, and some in drying acquire a fine aroma. They are quite as variable to the taste. The prevailing flavor is rather negative and peculiar to the order; but they are also bitter, acrid, biting, astringent, oily, and nauseous, as well as savory and agreeable. Most of them lose these qualities in drying.—Fungi have been used as an article of food from remote antiquity. The writings of the ancients make frequent mention of them as among their most esteemed viands. They are extensively eaten in Europe by all classes, and many works have been written laudatory of their virtues, with copious directions for dressing them in a great variety of ways. Notwithstanding the virulent poisonous qualities of some, others are eagerly

sought for, and in some places it is said that the people have burned down woods to get certain species of fungi whose growth followed the combustion. Within a few years much attention has been given in England to the edible fungi, and societies and clubs have been formed for the purpose of making the useful species better known by means of exhibitions, excursions, and dinners, at which the various edible fungi take the place of meats. So important is this subject regarded in England that in 1873 the royal horticultural society held an exhibition at which prizes were awarded for collections of both edible and poisonous fungi. The list of species which may be used as food is now large, but the great obstacle to the popularizing of them is the difficulty of distinguishing between the safe and dangerous ones. In America they have for the most part been regarded as noisome and disgusting by the great mass of the people; they have been usually despised as the unsightly evidences of decay, rather than eagerly collected as delicious food, which many of them are. During the late civil war the Rev. M. A. Curtis of Society Hill, S. C., who had long been our best instructed mycologist, turned his attention to the fungi as a source of food supply, and found that a great number of our native species were not only edible but highly palatable. He embodied his observations in a work, but unhappily died without seeing its publication. The mushroom proper (*agaricus campestris*) grows wild in old fields and pastures, but is propagated by planting its spawn, which is the mycelium of the plant, in hot-beds. Although this is the most widely used, many other species are equally excellent. The truffle (*tuber cibarium*) grows beneath the ground, and is eaten with avidity by different animals. (See MUSHROOM, and TRUFFLE.) Their reputation as aphrodisiacs is thought to be unfounded, having its origin in the old doctrine of resemblances. *Polyporus tuberaster* grows from the celebrated fungus stone *pietra fungia*, which is a mass of earth traversed by the mycelium of the plant; the latter is watered from time to time, and produces successive crops. The heads of poplar trees are watered in autumn, and they then bear the *agaricus caudicinus*, greatly esteemed. Blocks of the hazel tree are singed over straw and watered, and they produce in abundance the *polyporus corylinus*. Among other species eaten, the principal are *agaricus prynulus*, *orella*, *procerus*, and *exquisitus*, *lactarius deliciosus*, *cantharellus cibarius*, *doletus edulis*, *marasmius oreades*, *hydnum repandum*, *fistulina hepatica*, *morchella esculenta*, and *helvella crispa*. These are all fleshy fungi. Some of the most virulent poisons are found among fungi, and many fatal accidents have arisen from the eating of poisonous species, yet fungi which are known to be ordinarily injurious are eaten with impunity by some. Rye meal containing large quantities of ergot pro-

duces a terribly disgusting and fatal gangrenous disease. Pickling and salting renders many fungi innocuous. *Agaricus muscarius* is one of the most injurious; yet it is used as a means of intoxication by the Kamtchatdals. One or two of them are sufficient



Agaricus muscarius.

to produce a slight intoxication, which is peculiar in its character. It stimulates the muscular powers, and greatly excites the nervous system, leading the partakers into the most ridiculous extravagances. The only fungus used at the present day in medicine is the ergot of rye, sometimes employed in cases of protracted labor. Several others have been used in times past, like the *cordyceps Sinensis*, a sphaeroid species parasitic on a caterpillar; but these are now thought to be of no value. The lycoperdons or puffballs have been used as styptics. Some *polypori* make admirable razor strops when sliced with a sharp knife. *Polyporus fomentarius* and *igniarius* have for many years furnished the punk which is used as tinder, the corky portion being pounded till its compact mass of soft, silky fibres becomes loosened and flexible, and is sometimes used to make caps and other articles of clothing. *Agaricus muscarius* is used as fly poison.—Some fungi are among the greatest pests of the agriculturist. The rusts, smuts, and bunt of grain are all fungi of the genera *uredo*, *ustilago*, and *puccinia*. Their mycelium penetrates the tissues of the plants, destroys their vitality, and bursting through their cuticles covers them with myriads of their orange, brown, yellow, or black spores. They probably induce decay by a chemical influence which they exert on the juices of the infested plant, as well as by their mechanical interference with its organism. It has been a question how their spores are carried into the tissues, where their earliest growth is entirely separated from the outer atmosphere. But when we remember their extreme minuteness, we can understand that they may be drawn up with the fluids which enter their roots, or receive them directly into their tissues through the infinity of breathing pores with which the surfaces of the plants they infest are perforated. For many years agriculturists have had a prejudice against the common barberry as being injurious to wheat, and in some states it has been prohibited by law from growing near wheat fields. This has been looked upon by botanists as a whim which had no foundation in fact; but in

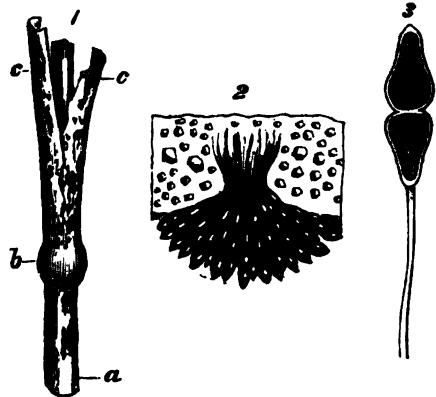
this case, as in others, popular belief was right, although the reason it assigned for the effect, in this case, the pollen of the barberry, was wrong. It is now found that the fungus so common upon the leaves of the barberry is one of the several forms of the wheat smut. The mildews of the grape and other fruits are myceloid growths, which in certain stages have been thought to be perfect plants (*oidium*), from their possessing a power of reproduction. Certain cells take on a vesicular growth filled with a mass of minute bodies which were thought to be the true fruit. But the later observations of Léveillé, Tulasne, and others, have shown that these are arrested stages of growth of an entirely different ascigerous genus, *erysiphe*. These produce their fruit in minute black pustules, from the base of which peculiar radiating processes arise, sometimes of great beauty. The mildews grow on the surface of fruits, and injure them more by choking up their pores and mechanically confining them with their dense, felt growth, than by abstracting their juices. The potato rot is accompanied by a rapid growth of the mycelium of *botrytis infestans*, which penetrates the leaves, stems, and tubers, inducing rapid decay. It appears on the surface in the form of a minute white mould. Many other plants are similarly affected. *Boletii* are sometimes traversed by a minute mould, *sepedonium chrysospermum*, which gives a golden-yellow hue to the flesh. Dry rot in timber is caused by the penetrating mycelium of *merulius laevis* and *polyporus destructor*. The black excrescent growth on plum trees is occasioned by the *sphaeria morbosa*, which covers the warts its mycelium has made with its minute black, compacted *perithecia*. The fairy rings which in olden times were thought to be the scenes of midnight fairy revels, are produced by the growth of different species of *agaricus*. As they exhaust the soil by one year's growth, their mycelium pushes into the richer portions around; and thus they extend the circle of their growth, furnishing, by their decay a manure for the next year's grass, which is darker and denser in consequence.—Fungi have been classified in various ways by different mycologists. By the early writers they were arranged according to their external appearances; but as more exact means of observation multiplied, their microscopic structure became better known, and a nearer approach was made to a classification in consonance with their true affinities. From Cæsalpinus in 1583 to Nees von Esenbeck in 1817, the pro-



Boletus edulis.

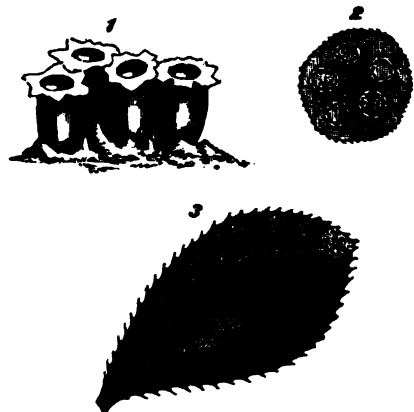
gress of knowledge was comparatively small for a period of nearly 250 years. But in 1821 appeared the *Systema Mycologicum* of Elias Fries, a work of the most learned and profound character, evincing a comprehensiveness and thoroughness far surpassing all that had preceded it. It is even now the great work to which all students refer, though since that time a host of observers have been exploring this obscure field, and collecting a vast array of facts concerning the laws which govern these minute organisms. Montagne, Lévillé, Tulasne, Berkeley, Desmazières, and many others have of late years been engaged in the elucidation of their structure. The latest system given to the world is that in Berkeley's "Introduction to Cryptogamic Botany," which is essentially similar to that of Fries. The two principal divisions are: *sporidiiferi*, spores contained in special sacs called *asci*; and *sporiferi*, spores naked, not enclosed. These are again subdivided into six principal orders, all formed on the mode in which the spores are borne, viz.: 1. *Ascomycetes* (Berk.), spores produced in little sacs (*asci*), and formed out of the protoplasm they contain. This order comprises a vast number of the black, pustular growths, abundant on dead wood, bark, twigs, leaves, &c. They are generally formed of a mass of carbonized cells arranged in the form of hollow spheres or cups called *perithecia*. Within these grow the *asci* containing the spores, which escape either from a pore in the perithecium or by its breaking up irregularly. The basal cells bearing the *asci* are collectively termed the *hymenium*. Among these are the mildews (*erysiphe*) and the black mildews (*capnodium*), and the whole great tribe of *sphæria*. The truffles (*tuber*) also belong here. They are subterranean, fleshy forms, whose substance is intersected by veins which are inward folds of the hymenium, covered by the expanding growth of the fleshy receptacle. The morels (*morchella*) and the *helvella* are carnosé, bulky forms, which have their *asci* on the outer surface of a variously folded, wrinkled, and pitted hymenium. The *cyttaria* is akin to these, of a sub-gelatinous consistence. These are all made up of compacted cells, forming horny, carbonized, or heavy, fleshy masses. 2. *Physomyces* (Berk.), spores growing in bladder-shaped cells on the end of delicate, individual, scattered fibres, composed of cells applied to each other in a linear series. A small group comprising the true moulds (*mucor*). 3. *Hyphomyces* (Fr.), spores naked, simple, or aggregated on the ends of fertile threads. These differ from the last in the naked growth of the spores. Here belongs the great host of minute moulds which cover almost every substance exposed to dampness with their floccose fibres. Nothing organic is free from their attacks. Their colors are sometimes extremely beautiful. To this order belong the mould of the potato rot (*botrytis infestans*), and many which induce decay in fruit. (*aidium*), the bread and cheese moulds

(*penicillium*, *aspergillus*), the rigid black moulds (*cladosporium*, *helminthosporium*), and the yeast and vinegar plants, which are submerged mycelia of *penicillium*. (See FERMENTATION.) 4. *Coniomycetes* (Fr.), spores naked on the ends of filaments or vesicles; hymenium



1. Wheat straw attacked by mildew. a, a. The stem, on which is the swelling b, from which has grown the aboeth-like leaf c, c. 2. Cluster of spores of corn mildew magnified. 3. Single spore of corn mildew magnified 800 times.

sometimes obsolete, sometimes contained in a perithecium. This order differs from the last in having scarcely any filamentous growth, and in having the spores produced in the utmost profusion, greatly disproportionate to the rest of the plant. It comprises an infinity of minute pustular forms, which infest the tissues of every variety of plant, many presenting to the eye but a mere speck on their surface. Here belong the whole family of rusts, smuts, and bunt



1. Cluster of cups from the barberry magnified. 2. Same from above. 3. Leaf of barberry, with a similar cluster.

(*puccinea*, *uredo*, *ustilago*, *tilletia*, *acidium*, &c.), which creep through the tissues of living plants, and finally burst forth on the exterior and fructify in dense, dusty masses, which cover their whole surfaces. Different species affect different organs, some being on stems and

leaves, others on flowers and fruit. They are the scourge of the farmer, whose fields they devastate. The savin trees (*juniperus*) are attacked by a peculiar genus (*podisma*), which bursts from their bark and swells under the influence of moisture to a gelatinous mass. It also occasions the globular excrecent growth called cedar apples, from orifices in which it protrudes in long orange-colored spurs, formed by the spores, tipping the aggregated mass of filaments. The black, irregular scars on apples are caused by the *epiloma fructigena*. An extensive group of this order comprises those minute pustular forms which, resembling the true ascigerous fungi in many respects, differ in producing their spores on the ends of the filaments instead of being contained in asci. There is great obscurity overhanging this whole group. They exhibit themselves in so many anomalous forms that it is almost impossible to establish limits to genera which may be clearly understood. Writers on the subject record great numbers of genera, but hardly any two agree upon their characters, and the whole subject is burdened with an inharmonious synonymy. New light has been shed upon the subject of later years by the observations of Berkeley, Lévillé, Tulasne, and others, who have pretty clearly established the fact that many so-called genera are merely stages of growth of true ascigerous fungi. Some genera, such as *erysiphe*, are known to produce several different kinds of reproductive bodies; and Tulasne has carried his researches into this manifold fructification, showing that many ascigerous species are attended by processes (*pycnidia*) which produce minute bodies (*spermatia*, stylospores) differing much from true spores, and growing beside them, sometimes within the same receptacle. He shows that certain growths recorded as distinct species of different genera and orders are, in fact, different forms of one single plant, whose perfect state is ascigerous. If such be true of the few whose progressive growth has been followed, we may safely conclude that the whole mass of coniomycetoid species, or at least those of the suborder *sphaeroneemi*, may be arrested or non-developed stages of growth of higher ascigerous forms. Such being the case, the classification of this whole order of plants will one day need rearrangement.

5. *Gasteromyces* (Fr.), mycelium gelatinous, floccose, or cellular, giving rise to a stalked or sessile peridium, composed of one or more coats; the spores borne on the apices of filaments lining the interior. This includes the whole tribe of puff-balls, as well as the subterranean fungi which look like truffles, but are dusty and smutty within. The peridium is generally of a rounded form, cracking in various ways at maturity, and giving forth myriads of spores like a cloud of dust. In some the hymenial tissue dries up at maturity, leaving the spores free (*lycoperdon*); in others it resolves itself into a fluid which drips from the elongated receptacle (*phallus*). In some

it retains its form, after parting with its spores, in an intricate mass of anastomosing fibres (*trichia*, *arcyria*). The *athalium*, which infests the hotbeds of greenhouses, belongs here. The earth stars (*geaster*) are peculiar in the dehiscence of the outer peridium, which splits

Earth Star (*Geaster hygrometricus*).

into segments and unfolds in a starry manner; it is also very hygrometrical, unfolding or closing as it is moist or dry. The little bird's nest fungus (*cruciatulus*) is peculiar in having its spores in distinct masses at the bottom of its nest-like peridium, looking like little eggs. *Sphaerebelus stellatus* has the remarkable power of projecting its sporangium to a great distance; the lower, internal part of the peridium is suddenly inverted at maturity, ejecting its soft sporangium, of the size of a mustard seed, several inches. The species of *phallus* and *clathrus* are notorious for the intolerable stench of their dissolving hymenium.

6. *Hymenomyces* (Fr.), mycelium floccose, webby, giving rise to a distinct hymenium, borne either immediately on the mycelium or on special receptacles bearing the spores on gills, wrinkles, tubes, prickles, &c. Here occur the jelly-like *acidia*, so common on trees after rains; the branching coral-like *clavaria*, abounding in our woods in autumn, all of which are edible; the corky *polypori*, bearing their spores in minute, compacted tubes beneath the receptacle termed a *pileus*; the *boletii*, which resemble the last except that they are fleshy, and of which many are eaten; the *hydna*, which bear their spores on the exterior of prickly-like processes; and, lastly, the *agarici*, which include the edible mushrooms and kindred forms, whose spores are borne on radiating blades beneath a cap borne up by a stem like an umbrella.—Mycology, as the study of fungi is termed, is among the most recondite of sciences. Among the authors whose works are of principal value are Berkeley, Bulliard, Corda, Desmazières, Fries, Greville, Klotzsch, Kromholz, Lévillé, Link, Montagne, Nees von Eabenbeck, Persoon, Schaeffer, Schweinitz (for American species), Sowerby, Tulasne, and Vittadini. The principal recent American authors are the Rev. M. A. Curtis and Mr. H. W. Ravenel. Of special value is Cooke's "Handbook of British Fungi" (3 vols., London, 1871). "Rust, Mould, and Mildew," by the same au-

thor, gives a popular account of the microscopic fungi.

FUNGIBLE, a word supposed to be derived from the phrase *functionem recipere*, in the civil law. It is not much known in English law, but is often used in French and Scotch law, and has recently been introduced into American legal language. It is used to mean what we have no other word for, that is, *res quæ pondere, numero, et mensura constant* (1 Bell's "Commentaries," p. 255), or things which may be returned or replaced by any others of the same kind, in contradistinction from those which must be returned or delivered specifically. Thus money is nearly always a fungible, because so much paid in any way that is a legal tender satisfies a claim for it. But it might happen that A lent B certain specific coins, for a specific purpose, which were to be specifically returned; and these would not be fungibles. If one lent to another corn, or meat, or manure, to be used, and return to be made in a like quantity of things of like quality, they would all be fungibles.

FUR, the covering of certain animals, especially such as inhabit the lands or waters of cold countries, distinguished from hair by its greater fineness and softness; also the skins of such animals dressed with the fur on. Before being dressed the skins are known in commerce as peltry. Fur is used especially for winter clothing, for which it is well adapted not merely by reason of its warmth and durability, but also on account of its great beauty. Skins of animals were among the first materials used for clothing. The ancient Assyrians used the soft skins of animals to cover the couches or the ground in their tents; and the Israelites employed skins which were dyed red as ornamental hangings for the tabernacle. The ancient heroes of the Greeks and Romans are represented as being clothed in skins; but the Romans of later periods regarded the clothing as that of barbarous times and people, associating it with the habits of the savage tribes on their eastern and northern frontiers. In the 2d or 3d century fur dresses appear to have been in use and in high estimation with the Romans. The fur of the beaver was in use, either in the skin or for manufacturing fabrics, in the 4th century; the animal was known as the Pontic dog. The sable of the far-off regions of Siberia was not known till many centuries later; but it was the productiveness of that region in furs that chiefly prompted the Russians to its conquest. In the early periods furs appear to have constituted the whole riches of the northern countries; they were the principal if not the only exports; taxes were paid with them, and they were the medium of exchange. In the 11th century furs had become fashionable throughout Europe. The art of dyeing them was practised in the 12th century, chiefly red. Richard I. of England and Phillip II. of France, in order to check the growing extravagance in

their use, resolved, in the crusade about the end of the 12th century, that neither should wear ermine, sable, or other costly furs. Louis IX. followed their example in the next century, when the extravagance had grown to such a pitch that 746 ermines were required for the lining of one of his surcoats. In these times the use of the choicer furs was restricted to the royal families and the nobility, and the fashion extended to the princes of less civilized nations, if it was not indeed originally adopted from them. In 1272 Marco Polo observed that the tents of the khan of Tartary were lined with rich skins. In 1387 the use of furs, which had become common in England, was prohibited by Edward III. to all persons not able to expend £100 per annum. The early trade of western Europe in furs was through the Hanse merchants on the south coast of the Baltic, who received them from the ports of Livonia. In the 16th century a direct trade was opened between the English and Russians; and a company of the former, protected by the czar, established posts on the White sea with a warehouse at Moscow, whence they sent parties to Persia and the countries on the Caspian. Ivan the Terrible sent presents of beautiful furs to Queen Mary and to Queen Elizabeth; but the latter prohibited the wearing of any but native furs, and the trade was abandoned. Siberia was about this time conquered by the Russians, and its tribute was paid in furs. This country also furnished large quantities to China; but the choicest kinds were taken to Moscow and Nizhni Novgorod for the use of the princes and nobles of Russia, Turkey, and Persia.—The settlers of North America early learned the value of the furs of the numerous animals which peopled the rivers, lakes, and forests. They collected the skins in abundance, and found an increasing demand for them with every new arrival from the mother country. The Indians were stimulated by trifling compensation to pursue their only congenial peaceful occupation. The Frenchmen, readily assimilating to the Indian habits, became themselves hunters and explorers; and the classes of *voyageurs* and *couvreurs des bois*, to which this trade gave rise, became the pioneers of all the new settlements. To protect and control the trade, forts were soon required in the Indian territory. That established at Mackinaw became an important central point. The value of this trade early engaged the attention of wealthy and influential persons connected with the government of Great Britain, as Prince Rupert, the duke of Albemarle, the earl of Craven, Lord Ashley, and others. After a successful enterprise in which they had embarked they obtained from Charles II. in 1670 a charter of incorporation, giving to them full possession of the territory within the entrance of Hudson strait not already granted to other subjects, or possessed by those of any other Christian prince or state. In this was included the mo-

monopoly of all trade in these regions, and this was the origin of the Hudson bay company. The territory they claimed extended from Hudson bay west to the Pacific, and north to the Arctic ocean, excepting that occupied by the French and Russians. They soon formed settlements upon the rivers which empty into Hudson bay, and carried on their operations with great vigor and success. The company continued to prosper notwithstanding the persistent opposition of the French. Their forts or factories were extended further into the interior of British America; and their power was supreme throughout the country, and in great measure over the Indians whom they employed to collect the skins. Still their charter had never been ratified by act of parliament. In 1749 a question arose in parliament respecting their rights, which was decided in their favor. But the Canadians organized a company in the latter part of the last century, composed of some of the chief merchants of Canada, under the name of the northwest company. Their headquarters were in Montreal, and their operations were carried on with great energy in the interior, extending to the rivers that flow into the Pacific, where they established factories about the year 1805. The annual meetings of the active partners were held at Fort William at the mouth of Pigeon river, on the N. shore of Lake Superior. The company thus soon became a formidable competitor with the Hudson bay company for the furs of these regions. In 1813 they acquired possession of Astoria on the Columbia, the settlement having been sold to them by Mr. Astor's partners in consequence of the war between the United States and Great Britain. The two companies were afterward involved for two years in actual war. In 1821 they united in one company, called the Hudson bay company, with the privileges of the old company extended by act of parliament over all the territory occupied by both. The license granted on May 30, 1838, for 21 years, expired in 1859. Formerly the company possessed large establishments scattered from Labrador to the Pacific, and from the northern boundaries of Canada to the Arctic ocean, which are of no value for any other purpose. In 1868 the proprietors sold the controlling interest in the company to a new body of proprietors, who in reorganizing increased the capital stock from £500,000 to £2,000,000, and elected Sir Edmund Head, who had been governor general of Canada, governor, and Sir Curtis Lampson, an American long resident in England, as deputy governor. The new organization, after protracted negotiation with the governments of Great Britain and Canada, transferred to the latter in 1869 almost the whole of their territorial rights, embracing an area nearly equal to that of the 13 original states of the American Union, for £800,000, reserving only a limited area in the vicinity of each fort or station. In 1870 a long pending dispute be-

tween the United States and the Hudson bay company, growing out of the claims of settlers in Oregon, Puget sound, &c., was settled by a commission sitting in Washington, awarding to the Hudson bay company \$800,000. The charter of the company having expired with all its rights of jurisdiction and territorial powers, it is now simply a trading company. The furs collected are sold at the great semi-annual sales of the company in London. Until within a recent date the mode of conducting these sales was at auction "by the candle." A pin having been stuck into a lighted candle, the bidding was continued until the pin fell in consequence of the approach of the flame, and the highest bidder before the fall of the pin was declared the purchaser.—The importance of the fur trade led to the early settlement of the western territories of the United States. The first organization for carrying it on was that commissioned in 1762 by M. d'Abadie, director general of Louisiana, made up by merchants of New Orleans, under the title of Pierre Liguette Laclède, Antoine Maxan, and co. Laclède, the principal projector, conducted the expedition to St. Genevieve, Mo., arriving there Nov. 3, 1763. The same year he selected for the site of his establishment the spot now occupied by the city of St. Louis, and then gave it that name. The place soon became of similar importance to Mackinaw and Montreal. The brothers Auguste and Pierre Chouteau were of his party; and they, with Pierre, son of the latter, became identified with the fur trade. (See CHOUTEAU.) In 1859 Martin Bates of New York and Francis Bates of St. Louis became the successors of Pierre Chouteau, jr., and still continue in the trade. The vast Indian territories bordering the great tributaries of the Missouri and the Mississippi opened a boundless and almost unexplored field for the operations of the fur traders. The Rocky mountains served only for a time as a barrier to their explorations, their trading posts, before ten years of the present century had elapsed, being established on Lewis and Columbia rivers. The furs, collected by long and tedious navigation in canoes and Mackinaw boats from the most distant sources, were brought down the dangerous rapids of the streams, and packed upon the backs of men around falls, and past the shoals which the hardest voyageurs might not navigate. Their market was then reached by another voyage of several months to New Orleans, where they were exchanged for a return freight of groceries; or to the great trading post of Mackinaw, whence the voyageurs went back with English goods. For 40 years preceding 1847 the annual value of the trade to St. Louis is supposed to have been between \$200,000 and \$300,000, and the latter half of this term much more than the larger sum named; but it was of still greater importance in developing the resources of the wild territories west of the Mississippi, and opening these to the settlement of civilized

races.—Of the eastern merchants engaged in this trade, the most prominent was John Jacob Astor, who embarked in it in 1784, at the same time making his residence in New York. He was a purchaser of furs in Montreal, which until the treaty of 1795 could be taken only to England for sale. Afterward he introduced them into New York, whence he shipped them to different parts of Europe and to China, his ships bringing from the latter in exchange the rich products of the East. About 1807 he engaged in the trade on the northern frontier, competing with the wealthy companies of Canada that had long occupied this field. Subsequently his trade was extended to the northwest, and the magnitude of his operations became immense, under a charter in the name of the "American Fur Company," of which he furnished the entire capital. He made a persistent effort to carry on the business between the Pacific coast and China, founding the town of Astoria at the mouth of the Columbia river; but that establishment being broken up in 1818 by the bad faith of a partner, who sold it for a nominal sum and placed it under the British flag, he afterward confined his operations to the region east of the Rocky mountains, his chief post being at Mackinaw. —The acquisition of the territory of Alaska by the United States in 1867 opened to Americans a new field for the prosecution of the fur trade. Until then the large fur products of that country had been collected by the Russian American fur company of St. Petersburg, through its agents in Alaska, and being concentrated annually at Sitka were sent to London and Russia. The furs from Alaska are mainly those of the fur seal taken on two small islands in Behring sea; the sea otter skins, taken mostly along the shores of the Aleutian or Fox islands; and general furs, such as those of the beaver, fox, marten, and bear, found in the forests of the mainland. These are nearly all collected by the natives of the territory, and traded off for the necessities of their mode of life. The catching of fur seals, however, is a special branch of the trade. The demand for skins of this kind having greatly increased, and the animal having been nearly exterminated in other parts of the world, the United States extended special jurisdiction over the islands of St. Paul and St. George, and passed a law regulating the taking of the seals. The exclusive privilege of catching the fur seal is granted by the government to the Alaska commercial company of San Francisco. The number of seals to be taken is limited to 100,000 per annum, and only males may be killed. No restriction is placed upon the taking of other kinds of animals, and the general fur trade is open to competition. The Alaska commercial company has about 20 trading posts on the mainland and islands of Alaska, where are gathered large numbers of skins, which are annually brought to San Francisco, and forwarded thence chiefly to London.

The annual value of the fur trade of Alaska is estimated at upward of \$1,200,000, while the sum received by the government as a tax imposed upon the taking of seals exceeds \$300,000 yearly. The number of fur skins collected in Alaska in 1872 was as follows:

Beaver.....	17,561	Mink.....	428
Ermine.....	1,849	Musquash.....	4,000
Fox, blue.....	8,981	Otter, land.....	1,476
" cross.....	1,184	" sea.....	8,683
" red.....	6,408	Sable.....	611
" silver.....	465	Seal, fur.....	100,000
" white.....	566	" hair.....	147
Lynx.....	259	Squirrel.....	68
Marten.....	10,684		

—The most fashionable and costly of all furs is the Russian sable, the skin of the *mustela eribellina*, which is about three or four times as large as the common weasel, to which family it belongs. A choice skin of the sea otter or the black fox may command a higher price than one of the Russian sable; but the cost of the latter will be relatively greater on account of its smaller size. The fur of the Russian sable is brown in summer, with some gray spots on the head, and may be distinguished from all other furs by the hairs turning and lying equally well in any direction. In winter, when the animal is usually taken, the color of the fur is a beautiful black. The darkest skins are the most valuable. In its natural condition the fur has a bloomy appearance; but dyed sables generally lose their gloss and the hairs become twisted or crisped. Sometimes the skins are blackened by being smoked, but the deception is exposed by the smell and the crisped hairs. A dyed or smoked fur may be detected by rubbing it with a moist linen cloth, which will then become blackened. It is said, however, that the Chinese dye the sables and give them a permanent color without destroying the gloss; in this case the fraud may be detected by the crisped hairs. The best skins are obtained in Yakutsk, Kamtchatka, and Russian Lapland. Only about 25,000 are annually taken, and these command extraordinary prices, the average price of a raw skin being about \$25, while a choice "crown" Russian sable will sell for \$200. But few of these furs reach the English or American market. The chief demand is in Russia, where the use of the sable is monopolized by the imperial family and the nobility, by whom it is chiefly used for linings for civic robes, coats, &c., and for ladies' sets. In America Russian sable is used for ladies' muffs and boas. The price of the choicest sets, consisting of these two articles, is from \$1,000 to \$1,600, though sets of lighter shade and inferior quality may be bought for from \$250 to \$400. Beautiful sets are also made of the tail of the animal. Of the sables, the next to the Russian in value and beauty is the pine marten, obtained in British North America, and known as the Hudson bay sable. The fur is fine, long, and generally of a lustrous brown color, which is frequently tinted to resemble the Russian

sable. The average value of a dressed skin is about \$3, and the choicest are worth about \$25. The Hudson bay sable is the leading fur in England, France, and Germany, for muffs, capes, collars, boas, &c., and is much worn in the United States in muffs and boas, a set costing from \$100 to \$300. Much inferior to this is the fur of the European pine marten, which is usually grayish brown; the skins range in value from \$1 to \$4, and are chiefly sent to England and dyed to imitate the finer grades of Hudson bay sable. The fur of the beech or stone marten is yellowish brown, but is often dyed in imitation of more valuable sables. The French excel in dyeing this fur, which therefore is often known as French sable. The best specimens are obtained in Europe, where it is much used for trimmings and articles of ladies' wear; in America it has passed out of general use. The value of an average skin is about \$3, and of the finest specimens about \$5. The mink or minx (*putorius vison*) is found in the northern parts of America, Europe, and Asia, the demand being chiefly supplied from America. The value of a dressed skin ranges from \$3 to \$8. The choicest furs have a chestnut-brown color glossed with black; those of a lighter color are less valuable, but are dyed in imitation of superior furs. The mink was formerly a favorite fur in America for muffs, collars, &c., and commanded a high price; but it is now rapidly passing out of fashion. One of the most noted furs of this class is that of the ermine (*P. erminea*), a small animal only 10 or 12 inches in length, much resembling the common weasel, and inhabiting the northern regions of Europe, Asia, and America. About 400,000 skins are obtained annually, the best from Russia, Sweden, and Norway. In summer the fur is yellowish brown, but in winter at the north it becomes a pure white and exceedingly beautiful. Further south the change from brown to white is less marked. In consequence of this peculiarity, the animal is generally caught in the winter, when its fur is most valuable. The end of the tail is shining jet black in all seasons, and is commonly inserted at intervals in the white fur, as an ornament. The paws of the black Astrakhan lamb are often substituted for the tail of the ermine. This fur, called *minever* in heraldry, has been the royal fur of several European nations, and has been much used in England to line the official robes of judges and magistrates, its snowy white color being regarded as the emblem of purity. In the reign of Edward III. its use was restricted to the royal family. At present it may be worn by any one; the modes of ornamenting it, however, as it is worn on state occasions, serve still to distinguish the sovereign and the rank of the peers, peeresses, judges, &c. Only the robes of the royal family can be trimmed with ermine thickly spotted with black paws of the Astrakhan lamb. The use of the ermine fur is restricted in Austria to the imperial family;

and it also distinguishes the sovereigns of Germany, Portugal, and Russia. The ermine is little used in the United States. The value of the skin is from \$1 to \$3.—The fur of the black fox is exceedingly rare; a single skin commands a higher price than that of any other animal, except perhaps the sea otter. The color is a glossy black with a silvery grizzle on the forehead and flanks. It is found in the N. W. part of the United States, in British North America, and in the arctic regions, the choicest specimens coming from Canada and Labrador. But few skins are obtained, and these command enormous prices; single specimens have been sold in London for £80, and there was exhibited at the world's fair in that city in 1851 a pelisse belonging to the emperor of Russia, lined and trimmed with this fur and valued at £2,000. The largest demand is in Russia, where it is worn by the nobility, and in China. The fur is fine and downy, and is used chiefly for ladies' sets and for trimmings, it being specially adapted as a trimming for velvet. A muff and boa of black fox fur are valued at from \$200 to \$500. In natural history and in commerce the black fox is known also as the silver fox; but among furriers and purchasers a marked distinction is made between a skin having black and one having silver fur, the difference being chiefly one of color. While the former has the appearance above described, the latter presents a rich, glossy, silvery color. The price of an average black fox skin is about \$80, and of the choicest about \$200; when the fur has the silvery appearance, it is valued at only about half as much. While these two grades are recognized by the London dealers, the number of skins bought and sold is generally classed under the head of silver fox. Next in value is the fur of the cross fox, the choicest skins being valued at about \$10; it is used for the same purposes as the preceding, and also for the finest kinds of carriage robes. The white fox (*culpes lagopus*) is very abundant in the arctic regions. Its color is white in winter, and brown, gray, or bluish in summer. The fur is long, fine, and woolly; it is used for ladies' sets, dress trimmings, and sleigh robes. The price of an average skin is about \$2 50, and of the choicest about \$5. They are mostly exported to Europe. Other varieties of fox furs of less value are those of the blue, the red, the kitt, and the gray fox. The furs of the two last named are extensively used in Turkey and Greece for linings for robes, &c. The skins of the red fox go chiefly to Germany, Poland, and Greece. The fur of the fisher, a North American animal much resembling the fox, is rich and soft and of a dark brown or blackish color. It is not much used in the United States, but is generally sent to Germany, Poland, and Russia, where it is used for linings of more costly furs, for trimmings, and ladies' apparel. The tail is also used for trimmings, and frequently as an ornament for the cap, especially at marriage fes-

tivities in Poland. The skins of the fisher are worth from \$10 to \$20 each.—The use of fur-seal skins has recently increased to such an extent that it is now one of the leading furs of Europe and America. In England it is a staple article for ladies' jackets. In Russia it is much used for linings, and in the United States it has become fashionable for both ladies' and gentlemen's wear. The total number of fur-seal skins annually obtained is about 160,000. They are found in small numbers on the E. coast of Asia, on the W. coast of South America, and in the South Atlantic and Indian oceans; but most of the vast resorts of former years in the Southern ocean have disappeared, and the race has been nearly exterminated by indiscriminate killing. The chief source of supply is now the islands of St. Paul and St. George, about 800 m. from the coast of Alaska, where seals resort in great numbers from May to November for the purposes of reproduction, rearing their young, and shedding their coats of hair. During this season the shores for miles are lined with millions of these animals, of which about 100,000 are annually taken. The seal skins, when taken from the animal, are simply salted, and in this condition sold to the manufacturers, who clean, dress, and dye them; the process taking about four months, and involving a vast amount of labor and skill to bring them into a proper condition to be made into garments. In the process of manufacture each skin is handled more than 200 times before it is turned out in a state suitable for the furrier's use. The natural color of the fur, which underlies the coarse hair or outside covering, is a dirty cinnamon, and the skins are dyed 12 to 18 times to bring them to the dark bronze or jet-black usually worn. The great amount of skilled labor required to perfect them adds materially to the cost. Thus the average price of raw skins is about \$18 each, and of dressed about \$21. The choicest specimens of the latter are valued at about \$65. Sacques made of seal skin for ladies command prices varying from \$100 to \$400. This is the only standard fur which is improved by being dyed; in all other cases this process is used to palm off an inferior fur for one of superior grade. But the fur of the seal is not only made more beautiful in color by being dyed, but it is changed from a curly to a straight condition, and acquires a rich velvety quality. The chief establishments for the preparation of seal skins are in London, and employ a large capital and numerous workmen. The knowledge of the dye used is kept a strict secret. There is but one establishment of this kind in the United States (in Albany, N. Y.), and this is of limited capacity. The skin of the hair seal, found on the E. coast of North America, is used for trunks, military purposes, &c.; that of the wool seal is used largely in the French army for knapsacks.—The skins of the otter (*Lutra vulgaris*, *L. Canadensis*) make a beautiful and

warm fur, which is much valued, especially by the Russians, Greeks, and Chinese. It is for the most part an American product; but it is also procured to some extent in the British Isles from a smaller variety of the species. Another small variety with short fur is also found in the East Indies. The American otter is most abundant in the British possessions. It has a dark glossy brown fur, which is of two kinds, one being short, soft, and thick, the other longer and coarser, and intermixed with the former. It is worn chiefly by gentlemen, and is also used for ladies' trimmings. The price of an average dressed skin is about \$13, and of the finest specimens about \$18. Among valuable furs that of the sea otter holds a high rank. Its production is limited, and it commands a very high price, \$400 being sometimes paid for a choice skin, while the average price is about \$50. These furs are extensively worn by the nobles of Russia, and are highly esteemed by the Chinese. The supply is obtained chiefly from the coasts and islands of the North Pacific and about Kamtschatka and Alaska. About 4,000 are annually taken off the coast of Alaska. The thick glossy fur, which is exceedingly fine and long, has a prevailing rich black color, tinged with brown above, and presenting lighter colors below. The finest kinds are sometimes tipped with silver-gray hairs. It is a curious fact that the skins of this animal are sometimes taken almost around the world before reaching the place where used. Thus many of them, caught N. W. of Alaska, are sent successively to San Francisco, London, Leipsic, Moscow, Nizhni Novgorod, and finally to their destination in China.—The chinchilla (*Chinchilla lanigera*) is an animal intermediate between the squirrel and the rabbit, and inhabits South American countries. Individuals producing the darkest and best colored skins are found in the cold mountain regions of Chili and Peru. The fur, which is silvery gray, is remarkable for its fineness and softness. It is used for ladies' and children's sets, but more especially for lining and trimming cloaks and other articles of clothing. About 100,000 skins are taken annually, which are chiefly consumed in France, Germany, and Russia. The best skins of the Arica chinchilla, from Buenos Ayres, are worth about \$6, though the average price is only about half that sum.—The lynx includes the Canada lynx and the lynx cat (*Felis Canadensis*, *F. rufa*). The fur is soft, warm, and light, naturally grayish, with dark spots, but commonly dyed a beautiful shining black. It is used for facings and linings of cloaks, for the most part in America, brought back from England. It is also largely used for ladies' mourning attire. The skins of the lynx are valued at from \$3 to \$5. The fitch is the European polecat (*Putorius communis*). Its fur is of about the same value as that of the lynx, and is used chiefly for coat linings and ladies' wearing apparel. The demand for it

in the United States has greatly diminished.

—Less costly furs used for general purposes are those of the raccoon, rabbit, skunk, squirrel, wild cat, and muskrat. The skins of the raccoon (*procyon lotor*) are obtained from North America, and sent chiefly to Russia and Germany, where they are the great popular fur for lining coats, &c. The average price of raw skins is about 50 cts., though the choicest black specimens sell for \$8. This fur has also been used in the manufacture of hats. Rabbit skins are used in the natural condition and dyed for articles where cheapness is essential. They are extensively used by hatters. The Siberian squirrel has a short silky fur of a beautiful gray color, which is used chiefly in Europe for linings and small articles worn by ladies and children. The skins are worth from 50 to 75 cts. each. Of about the same value is the skin of the wild cat, used chiefly in Europe for coat linings and cheap sleigh robes. The muskrat or musquash (*fiber zibethicus*) is a native of North America, found generally along the banks of streams and in meadows. The skins are worth about 30 cts. each. They are generally dyed, and furnish a popular fur in Germany and Italy for linings and ladies' apparel. The skin of the skunk is an American production, valued at from 50 cts. to \$1. It has been used in this country for linings and small articles of apparel, often under the name of Alaska sable. The demand for it is rapidly decreasing, and it is now chiefly used in France and Germany.—The fur of the beaver (*castor Americanus*) is fine, thick, and of a uniform reddish brown. The skins are obtained chiefly in British America and exported to England. The price of an average dressed skin is about \$3 50, and of the best about \$8. Formerly this fur was much used in the manufacture of hats, and was the leading article in the fur trade; but its use for this purpose greatly diminished in consequence of the employment of silk and other less expensive materials. It has, however, again been brought into extensive use by the introduction of a process of preparing the skins by which a handsome fur for trimmings and for gentlemen's collars and gloves is obtained. The fine silky wool of the beaver has also been successfully woven. The white wool from the belly of the animal is still used in France for bonnets. Sleigh robes are often made of beaver skins. Much resembling the fur of the beaver is the nutria fur of the coypu, obtained from South America. The skins are worth from 12 to 25 cents each, and are chiefly used in America in the manufacture of hats.—The above constitute the leading furs used as articles of apparel for comfort or ornament. There are valuable skins of other animals which are extensively used for special purposes. Among these are the bear, buffalo, wolf, and wolverene. In northern regions bear skins afford the most useful and comfortable material for beds, caps, gloves, and other articles of clothing. Further south, in Europe and

America, they are used for sleigh robes and mats. The most valuable of the bear skins is that of the white or polar bear, which has a fine, long, soft fur, silvery white tinged with yellow. The average value of a dressed skin is about \$60, while a skin of the best quality is worth about \$150. The skins of the black bear (*ursus Americanus*) and grisly bear (*U. horribilis*) are used for military purposes, while articles of ladies' apparel are sometimes made of the fur of the brown bear. The skins of the black and the brown bear sell for from \$20 to \$40 each, while that of the grisly bear commands a somewhat lower price. The skins of the wolf and the wolverene are generally used for sleigh robes and mats, though cloak linings are sometimes made of the latter in Germany. The average value of wolf skins is about \$2; the finest specimens from the Hudson bay region are worth about \$6. The skins of the wolverene are valued at from \$3 to \$7.—Valuable furs are supplied from many other animals besides those enumerated, as the badger, whose long wiry hairs are also used for shaving brushes. The domestic cat is bred in Holland for its fur, and the skins are merchantable in the United States, being worth from 10 to 50 cts. each. Mention has been made of the paws of the black Astrakhan lamb. This animal is covered with the most rich and glossy silk-like fur, all the more delicate, it is said, when obtained, as is not unusual, by slaughtering the mother before the birth of the lamb. The fur of the Persian gray and black lambs is made the better to retain its curliness by the practice of sewing the animal tightly in leather immediately after its birth. The furs of the leopard, tiger, lion, &c., find uses as sleigh robes, mats, &c.—The most valuable furs are generally obtained from small animals inhabiting cold countries. Land fur-bearing animals are taken by means of the dead-fall, poisoning, shooting, and steel traps. The last named method is the best and the one most generally practised, as the fur of the animal if captured in any of the other ways is likely to be injured. All furs, at least of the land animals, are in the best condition in the winter; the trapping, therefore, is generally carried on between the first of October and the middle of April. During the summer the fur-bearing animals generally shed their coats, or at least lose the finest and thickest part of their fur. At the approach of winter the fur becomes glossy, thick, and of the richest color, and the inside part of the skin, or pelt, when taken from the animal and dried, has a clean, white appearance. The fur seal, however, is taken between May and November.—As a rule, furs, except those of the highest class, are not regarded with the most favor in the country where they are obtained. The price of the fur is regulated more by fashion than by its intrinsic value, and is therefore subject to marked fluctuations. The handsome fur of the black skunk was fashionable for many years before it was worn in the United

States; while the fur of the fitch, which was at one time generally worn here, was not esteemed in Germany; and so the silver-gray rabbit, despised in England, was long highly prized by the mandarins of China. Several kinds of furs which commanded high prices a few years ago are now in little demand in consequence of having become unfashionable. The values heretofore mentioned are given by O. G. Gunther's sons of New York, the leading dealers of the United States in manufactured furs, as the average wholesale prices for 1874, according to the London market. The greater portion of the furs of commerce are collected from the North American continent.—The chief fur market of the world is London. Two great semi-annual sales, attended by dealers from all parts of the world, are held in March and September, besides a sale of less importance in January of each year. Two great an-

nual fairs for the sale of furs and other articles are also held in Leipzig, the supply of furs being largely obtained from the London sales. The larger portion of the furs sold in London are offered by the Hudson bay company and C. M. Lampson and co., the former importers and the latter commission merchants. It is estimated that the value of the furs sold annually by them and some smaller dealers is about £1,800,000, including seal skins valued at £400,000, all of which are the production of the United States and British America. In addition to the above, American furs to the value of about £100,000 are annually sent direct to Germany and Russia. The variety of furs in use, their relative value, and the extent of the fur trade, are indicated in the following table of sales in London in 1873 of the two leading fur-dealing companies of the world:

KINDS.	HUDSON BAY COMPANY.					C. M. LAMPSON & CO.				
	March sale.	September sale.	Total.	Prices, according to quality.	Estimated average price per skin.	March sale.	September sale.	Total.	Prices, according to quality.	Estimated average price per skin.
Badger.....	2,700	.....	2,700	1s. @ 7s.	£ 1 6	1,300	1,018	2,318	1s. @ 5s. 4d.	£ 2 6
Bear.....	5,217	2,794	8,011	5s. @ 28 10s.	5 0 0	2,102	1,608	3,710	4s. @ 26 6s.	£ 10 0
Beaver.....	111,998*	87,032	199,030	4s. 5d. @ 88s. 6d.	1 0 0	4,616	19,212	23,828	5s. @ 21 12s.	16 0
Cat, wild.....	.....	.....	.....	.....	.....	2,512	5,270	7,782	1s. 9d. @ 7s.	£ 3 0
" domestic.....	.....	.....	.....	.....	.....	1,115	5,244	6,359	1d. @ 10d.	£ 6
Fisher.....	2,343	779	3,122	8s. @ 25 5s.	2 10 0	508	1,680	2,188	5s. @ 23 9s.	£ 3 0
Fox, blue.....	90	.....	90	18s. @ 24.	2 10 0	1,164	508	1,672	17s. @ 24 2s.	£ 10 0
" cross.....	1,310	471	1,781	5s. @ 24.	1 10 0	1,491	920	2,411	5s. @ 23 2s.	£ 1 5 0
" gray.....	.....	.....	.....	.....	.....	10,006	.....	10,006	1s. 10d. @ 5s.	£ 3 6
" kitt.....	.....	.....	6,980	2s. 6d. @ 29s. 10d.	8 0	1,266	.....	1,266	1s. 6d. @ 3s.	£ 2 6
" red.....	1,358	8,297	9,655	4s. 6d. @ 17s.	10 0	26,523	18,250	44,773	4s. 6d. @ 14s. 3d.	£ 3 0
" silver.....	143	633	776	23 10s. @ 231.	10 0 0	202	224	426	23 @ 214.	£ 5 0 0
" white.....	.....	7,812	7,812	2s. @ 14s. 9d.	7 0	1,016	166	1,182	3s. 3d. @ 18s.	£ 6 0
Lynx.....	1,602	4,190	5,792	9s. 6d. @ 21 14s.	13 0	1,269	622	1,891	4s. @ 29s.	£ 15 0
Marten.....	4	18,855	18,859	10s. @ 23 19s.	1 10 0	15,451	9,612	25,063	5s. @ 23 6s.	£ 1 5 0
Mink.....	8	12,806	12,814	4s. @ 21 8s. 6d.	15 0	30,264	12,284	42,548	1s. @ 31s.	£ 15 0
Musquash.....	65	116,439	116,504	3d. @ 16d.	8	497,327	473,815	971,142	3d. @ 2s. 1d.	£ 10
Opossum.....	.....	2,631	2,631	14s. @ 23 18s.	2 10 0	41,496	75,252	116,748	1d. @ 20d.	£ 6
Otter.....	.....	98	98	24 10s. @ 232.	15 0 0	1,625	3,010	4,635	5s. @ 23 12s.	£ 3 5 0
" sea.....	.....	.....	.....	.....	.....	2,884	1,881	4,765	2s. @ 27s.	£ 18 0 0
Rabbit.....	1	.....	10,029	3d. @ 4d.	8	6,125	9,899	16,024	1d. @ 2d.	£ 2
Raccoon.....	.....	3,532	3,532	1s. @ 8s. 3d.	.....	133,085	197,997	331,082	4d. @ 23.	£ 2 0
Sables.....	.....	.....	.....	.....	.....	1,356	940	2,296	21 @ 23 19s.	£ 3 0 0
Skunk.....	.....	1,691	1,691	2s. @ 7s.	4 0	101,071	34,523	135,594	1s. @ 9s. 6d.	£ 4 0
Wolf.....	183	6,404	6,587	6s. @ 27 15s.	15 0	661	915	1,576	5s. @ 7s. 3d.	£ 6 0
Wolverene.....	.....	820	820	8s. @ 21 1s.	15 0	.....	.....	.....	.....	.....

In addition to the above, about 160,000 fur-seal skins were sold at from 5s. to £4 4s. each, the average price being about £2. There are also sold annually in London a considerable number of chinchilla, nutria, and ermine skins. Besides the furs sold in London, a moderate portion of those annually collected in the United States are retained there for use, amounting to about 150,000 mink and 750,000 musquash skins; and a small number of the other furs are manufactured and worn. The number of the chief fur skins annually collected in Russia, Sweden and Norway, Iceland, and Greenland has been estimated as follows: badger, 23,000; bear, 2,800; cat,

205,000; ermine, 50,000; fitch, 220,000; fox—silver and cross 100, blue 6,500, white 23,000, red 85,000; hare, 1,200,000; lynx, 9,000; marmot, 5,000; marten, 60,000; mink, 55,000; otter, 9,000; sable, 6,000; seal (hair), 330,000; squirrel, 1,000,000; stone marten, 150,000; wolf, 6,000; wolverene, 700.—FUR DRESSING. As skins are sent to market they have been commonly merely dried in the sun or by a fire; but small skins are sometimes first steeped in a solution of alum. The object is to render the pelt perfectly dry, so that when packed it shall not be liable to putrefy. When stored in large quantities the skins are carefully protected from dampness. As the fur dresser re-

* January sales.

† Including 21,491 at the January sale.

‡ Including 624,318 at the January sale.

§ Including 61,044 at the January sale.

ceives the skins he causes them to be subjected to different processes according to the kind of fur and the object for which it is intended. The fine qualities for ornamental dresses are usually placed in tube together with a quantity of rancid butter or lard, and are then trampled upon by the feet of men. The pelt thus becomes softened, as if partially tanned. They are next cleaned of the loose bits of integument by rubbing them with a strip of iron. The grease is then removed by trampling them again with a mixture of sawdust (that of mahogany is preferred) and occasionally beating them, and combing the fur. Another process is to steep the skins in a liquid containing bran, alum, and salt, in order to cleanse them from greasiness, and then to apply a preparation of soap and soda, which removes a kind of oil formed in the fur itself. Finally the skin is washed in clear water and dried, when it is found to be dressed and converted into thin soft leather. This is all that is necessary to prepare them for the cutter, whose office it is to cut out the variously shaped pieces, and sew them together to make the different articles. The cutting requires much skill to avoid waste. From a great number of similar skins parts of the same shades of color are selected, and thus each muff, mantle, or other article is made to present a uniform color. The seams are concealed by the lining with which the furs are finished. For the treatment of fur skins used for felting, see *HAT*.—Furs are subject to injury by moths, which deposit their eggs at the roots of the fine hairs, and as soon as the worm is hatched it begins its work of destruction. They will also decay if exposed to moisture. To preserve furs, therefore, it is necessary to keep them dry and well aired, and to protect them from moths. The latter object is often accomplished by frequently beating the furs and keeping them in a camphor-wood or cedar-wood trunk or apartment, or by sprinkling them with camphor, tobacco, or powdered cedar or sandal wood. Some of the largest dealers find that the most effective method for preserving furs from moths is simply to beat them about once a month with a rattan.

FUREEDPOOR, or *Dacca Jelalpoor*, a district of the commissionership of Dacca, Bengal, British India, bounded N. by Mymensing, E. by Dacca, S. by Backergunge, and W. by Jessore and Pubna; area, 2,052 sq. m.; pop. about 850,000. It is wholly alluvial, and, being intersected frequently by the Ganges and its branches, is periodically inundated, particularly in the S. and N. E. parts, which are low and marshy; but in the N. and N. W. the land is more elevated. The soil is of extraordinary fertility, producing large crops of rice, sugar cane, cotton, hemp, indigo, pulse, and oil seeds. Sugar, indigo, and rum are manufactured, and much coarse cotton cloth is made for home use. The population is composed of Mohammedans and Brahmans, about equally divided, the latter being the more numerous

in the N. part. There are also several thousand native Christians, descendants of the offspring of Portuguese men and native women. The district was granted to the East India company in 1765 by Shah Alum.—**FUREEDPOOR**, the capital of the district, is a straggling town on the right bank of the Ganges, 115 m. N. E. of Calcutta. The principal buildings are those of the civil departments of the government. It was once a noted resort of river pirates.

FURETIERE, *Antoine*, a French author, born in Paris about 1620, died May 14, 1688. He was successively an advocate, a fiscal agent, an abbé, and a prior, and was admitted into the French academy in 1662. While the academy was preparing its dictionary, Furetière, regarding the work as defective, determined to edit and publish a lexicon on his own account. Hence the academy excluded him, and a war of epigrams, satires, and libels, unsurpassed for violence, began between him and the leading academicians. Furetière was protected by the most important personages, by Racine, Boileau, Molière, Bossuet, and even Louis XIV., and his wit and vivacity distinguished him in society; but his death occurred before the suit which he prosecuted against the academy was decided. His dictionary, enlarged by *Banage*, passed through several editions. He wrote also a few fables and poems.

FURIES. See *EUMENIDES*.

FURLONG (*Sax. far* or *fur* and *long*), an old English measure of 40 rods or poles, equivalent to $\frac{1}{4}$ of a mile. In Ireland it is 0.15 of a mile, and in Scotland 0.1409. In the United States the measure is not in use. As a superficial measure, a furlong in Great Britain is generally 10 acres, according to the acre of different counties; but it was formerly used for a piece of land of no particular dimensions.

FURNACE (*Lat. fornax*), a structure containing a fireplace, intended for maintaining intense heat. In many of the useful arts the first requisite is the means of obtaining a very high temperature. In all metallurgic operations, the object of which is the reduction of the ores and treatment of the metals, and in almost every art involving the use of fire, a furnace of some kind for producing this heat is in demand. The ancient Greeks employed furnaces for casting statues of bronze; Homer makes mention of a blast furnace with 20 crucibles (*Il. xviii. 470*). The Egyptians are known to have made use of melting pots, but we have no knowledge of their furnaces. An ancient smelting furnace was discovered near Arles, in southern France, which was shaped like an inverted bell, having under the surface of the ground a channel for the discharge of the melted metal. Strabo speaks of furnaces built in Spain, which were raised to a great height for conveying off the noxious fumes; they were also furnished with long flues and chambers for collecting the oxides and other sublimed matters. The forms and dimensions of modern furnaces vary greatly according to the different

purposes they are designed to serve. The iron manufacturer, smelting the ores upon a vast scale, builds an immense structure with a capacity of hundreds of tons, and furnishes it with heavy machinery for supplying the great volume of air blown in almost without ceasing, as the operation is continued during a single blast of two years or more.—All furnaces employed in melting refractory materials—those for assaying, as well as those operating upon a large scale—require a free supply of air, proportional in quantity to the amount of fuel they consume. The generation of heat depends upon the rapid chemical combination of carbon with oxygen, and a sufficient supply of the latter element is as essential as is that of the former. Every pound of good bituminous coal, according to Dr. Thomson, requires 150 cubic feet of air, or allowing one third more for waste, there should be supplied at least 200 cubic feet. So immense is the quantity of this invisible element consumed and wasted in the large furnaces for smelting iron ores, that its weight even is greater than that of all the other materials, ores, coal, and flux, introduced; and the power required to force this volume of air through the dense column of heated matters far exceeds that expended in charging the furnace with its solid contents, even adding to this the power involved in the removal of the products of the operation. To provide for this large supply is then a matter of the first consequence to furnaces; and according to the mode in which this is effected they are separated into two classes. The kind called air or wind or reverberatory furnaces receive their supply by means of the current produced by a tall chimney, the heated column rushing upward through the flue. To fill the space in the lower part of the flue, air presses in from without through every aperture; and none being allowed except those leading through the receptacle for the fuel, the supply of air is thus secured, heat is generated for the purposes required, and a portion is expended in furnishing the mechanical power involved in the movement of the current of air. Fireplaces, stoves, and grates are examples of air furnaces; and by means of the blower, which causes the air admitted into the chimney to pass first through the fire, the flue is prevented from becoming chilled by the entrance of cold air, the column ascends more rapidly, an increased supply of air is furnished to every portion of the body of fuel, and the chemical process goes on with augmented intensity and generation of heat. The other classes of furnaces are supplied with air through bellows or other blowing apparatus. (See BLOWING MACHINES.) They are called for this reason blast furnaces, and are used when the resistance opposed to the passage of the current of air by the density of the contents of the furnace is so great, that sufficient quantity cannot penetrate to keep up thorough combustion throughout the mass; or when the operations do not admit of the large openings

beneath the fire, which the free admission of such bodies of air would require; or again, when the nature of the operation demands an intensity of heat concentrated in one spot. The blast in this case acts like the jet of the blow-pipe, and its effect is in many cases greatly increased by its being conveyed through iron pipes which are highly heated by exposure in suitable ovens to the waste heat of the smoke and gases which escape from the chimney. It thus restores to the interior of the furnace, in the form of highly heated air, a portion of the calorific that would otherwise be lost. Furnaces of both classes are often used in the chemical laboratory; but the blast furnace is rather preferable because it can always be more perfectly controlled. The one commonly employed for general purposes is a wind furnace, built of fire brick, and strongly secured with iron rods and straps. It has a flat top, with two or more openings, and on these are placed pans of cast iron for holding sand in which vessels are placed for exposure to moderate heat. The furnace has under the flue that leads into the chimney an oven for drying. With a good draught this furnace produces sufficient heat for many crucible operations. These are, however, better conducted in smaller furnaces, either wind or blast, constructed specially for this use.—The construction and manner of using the various kinds of reverberatory, blast, and assay furnaces will be found described under the heads ASSAYING, BLOOMERY, CASTING, COPPER SMELTING, IRON MANUFACTURE, and others which treat of processes involving the use of these furnaces.—Gas furnaces employ gas instead of solid fuel, and are constructed in a variety of forms, but always upon the principle of the Bunsen's burner. (See FLAME.) Griffin's blast gas furnace, for metallurgic operations requiring high heat, is shown in section in fig. 1. Two fire-clay cylinders, *a, a*, form the body of the furnace. They rest upon a perforated fire-clay plate, *b*, into which the gas burner, *c*, is introduced. A plumbago crucible, *d*, sets upon a perforated plumbago cylinder, *e*, and is covered to a considerable depth with quartz pebbles from half an inch to an inch in diameter; *f, f* are plugs which may be removed to admit of inspection. The burner is represented in fig. 2, and consists of two chambers of cylindrical cast iron, one for the reception of air and the other for gas. Tubes, varying in number from 6 to 20 or more, pass from the air chamber through the gas chamber, and

FIG. 1.—Griffin's Gas Furnace.

through the axes of tubes passing from the latter, thus securing admixture of the combustible gases. A stand, *g*, fig. 1, supplied with a thumb screw, holds the burner at any desired

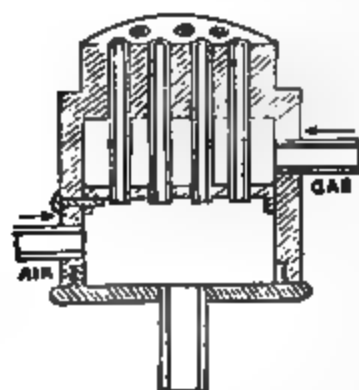


FIG. 1.—Gas Burner, Griffin's Furnace.

distance below the crucible. The gas is supplied at the usual pressure, but the air is urged with a bellows or other blowing machine at about 10 times that pressure. In the experiments made by the inventor, the gas and air pipes were of $\frac{1}{2}$ in. calibre and 10 in. long, the gas having a half-inch and the air a five-inch water pressure. The quantity of gas used per hour was about 100 cubic feet. Fig. 1 represents the furnace with the gas burner in an erect position, but it is perhaps more frequently used at the top, inverted, as shown in fig. 3, in which an additional perforated clay plate, *h*, is laid on the top of the upper clay cylinder.

Into the perforation the burner is introduced, and when in action throws its flame down upon the top of the crucible, *d*, which is now placed upon a foundation of clay plates, *k, k, k*, raised to the proper height, and of such a size as to leave a vacant space between them and the clay cylinders, which is filled with quartz pebbles, and through which the burned gases pass on their exit, which is now through perforations in the two lower clay plates. The hot gases give up nearly all their heat to the pebbles, and escape at a much lower temperature than would be supposed. The following experiment shows the power of this furnace: A clay crucible, 8 in. in both diameters, was filled with 24 oz. of cast iron, and not covered. The flame being thrown directly upon the iron, it was soon covered with a crust of magnetic oxide. In 20 minutes the crucible was removed, and a hole being broken through the crust, 20 oz. of melted iron was poured out. In the same furnace 16 oz. of copper can be fused in 10 minutes, commencing with the furnace cold, or in 7 minutes after it is hot. Gore's gas furnace is heated by a burner in which the air and gas are more thoroughly mixed previous to ignition than in Griffin's, but it is generally used in

FIG. 3.—Griffin's Furnace, with Flame inverted.

smaller operations.—One of the most important improvements which have been made in the arts is Siemens's regenerating gas furnace, which received the grand prize at the Paris exposition of 1867. The invention is not only important as affording an easily managed furnace of great power, but in possessing great economy in regard to fuel. It consists of three essential parts: 1, a gas producer; 2, a regenerator; and 3, a furnace chamber. The gas producer is shown in fig. 4, and is constructed somewhat like a base-burner warming stove, although the action and gaseous products are different because of the different direction of the draught. Bituminous coal is introduced at *A*, and falls down over an inclined plane, *B C*, the lower part, *C*, being a grate for the admission of air. At *D* there is a stoppered opening, through which an iron bar may be passed to clear the walls of clinkers. At *E* there is an opening controlled by a valve, and which leads into a flue, *F*, passing to the regenerator. The action is as follows:

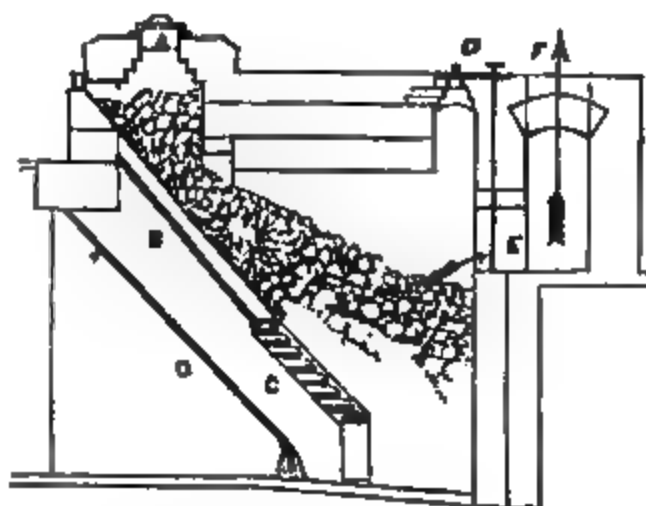


FIG. 4.—Gas Producer, Siemens's Furnace.

The coal, being ignited at the grate, is heated to different degrees, a portion being converted into hydrocarbon gases and vapors, in the same manner as in a gas retort. Another portion, answering to the coke, principally combines with the oxygen of the air coming through the grate and forms carbonic acid, which is therefore a waste product; but a portion of it decomposes steam and furnishes combustible gases, as will presently be explained. But this carbonic acid, having to rise along with the other gases through the incandescent coal above, combines with another equivalent of carbon, forming carbonic oxide, which passes on into the flue with the other combustible gases. But for every cubic foot of carbonic oxide thus produced (the air consisting of about four parts in five of nitrogen by volume), two cubic feet of incombustible nitrogen are also taken up, tending to diminish the heating power. A small stream of water is delivered by the pipe *G* at the foot of the grate, and there being converted into steam ascends with the draught into the incandescent coal, where it is decomposed, with the generation of hydrogen and carbonic acid gases.

The generation of these gases is at the expense of heat, and therefore the amount of heat which they add in burning is inconsiderable, but the use of the steam serves to regulate the heat in the gas producer. When the heat rises more steam is decomposed, which action diminishes the heat in the gas producer, but increases it in the furnace chamber, where the mixed gases and air are burned. Fig. 5 gives a representation of the regenerators and the furnace chamber. There are two pairs of regenerators to each furnace chamber; one in each pair being for the transmission of air and the other for that of the gases furnished by the gas producer. The regenerators are chambers containing fire bricks, L, built up with open spaces between them to allow of the passage of the gases and air. These fire bricks are for the

purpose of absorbing the heat which issues from the furnace chamber, and again yielding it to the gases which pass to the furnace chamber; and this is effected by having two pairs, which are alternately made to deliver currents to and receive them from the furnace chamber, by turning the valve S, in the centre of the figure, one way or the other. K K is the heating chamber, into the right-hand end of which, as the valve S is now turned, the gases and air are received from the regenerators on the right hand also. The air enters through the openings O O, and the gases from the gas producer through R R. The air, having traversed the openings between the hot fire bricks, passes through N into the entrance of the furnace chamber, where it meets with the gases, heated in the same manner, coming through

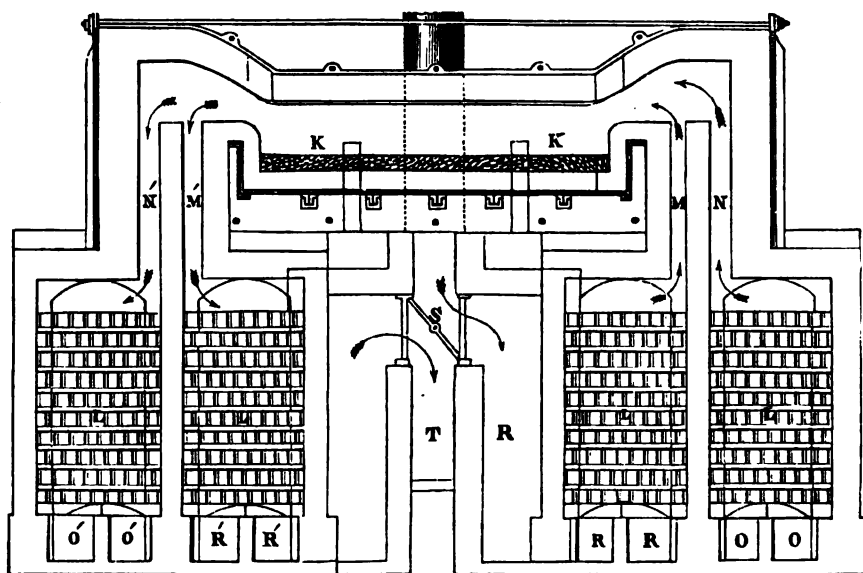


FIG. 5.—Siemens's Furnace.

M. The two unite and produce an intense and uniform flame. The heated gases which are the products of the combustion in the furnace chamber pass out at the other end, down the flues M' N' and through the regenerators, yielding their heat to the fire brick in them, and passing into the flue of the tall chimney T. When these regenerators have become sufficiently heated, the valve S is reversed, and the air and gases are received through O' O and R' R, passing up through M' N' into the left-hand end of the furnace chamber, and out at the other end, through M and N, where before they were received. The flues which pass from the gas producer to the regenerators are not shown in the figures. The gas producers are at a higher level than the regenerators, and therefore a current of gas can be made to flow from the former to the latter by allowing it

to cool in the descending portion. The mixture of gases on leaving the producer has a temperature between 300° and 400° F., but on arriving at the descending portion of the flue has lost from 100° to 150°, which increases its density 15 or 20 per cent., so that a current is urged toward the regenerators, which is increased by the expansion produced by the heated fire bricks. These furnaces are used with great advantage when high and regular heats are required for long periods, and are peculiarly applicable for metallurgic operations, on account of the facility with which, by increasing the amount either of air or of gas in the combustible mixture, an oxidizing or a carbonizing flame may be produced. They are also admirably adapted to glass manufacture, and were at first chiefly employed for that purpose.

FURNESS, William Henry, D. D., an American clergyman and author, born in Boston, Mass., April 20, 1802. He studied at the Boston Latin school, graduated at Harvard college in 1820, completed his theological course at Cambridge in 1823, and was ordained pastor of the first Congregational Unitarian church in Philadelphia in January, 1825. One of his constant labors as a preacher and author has been to ascertain the historical truth and develop the spiritual ideas of the records of the life of Christ. To this end he has published "Remarks on the Four Gospels" (Philadelphia, 1836; London, 1836 and 1851); "Jesus and his Biographers" (Philadelphia, 1838); a "History of Jesus" (1850; new ed., Boston, 1858); "Thoughts on the Life and Character of Jesus of Nazareth" (Boston, 1859); "The Veil partly lifted and Jesus becoming visible" (Boston, 1864); and lastly, "Jesus" (Philadelphia, 1870). These works reveal a highly cultivated intellect, impelled by enthusiastic ardor and enriched by a glowing fancy, and present a peculiar humanitarian view of the character of Christ. "Æsthetic considerations," says a writer of his own denomination, "weigh more with him than historical proofs, and vividness of conception than demonstration." Dr. Furness has published a volume of prayers, entitled "Domestic Worship" (2d ed., Boston, 1850), and a volume of discourses (Philadelphia, 1855). He has also written hymns and other devotional pieces in verse, and has made exquisite translations from the German, among which are the "Mirror of Nature" from Schubert, the "Song of the Bell" from Schiller, a volume of "Gems of German Verse" (enlarged ed., 1859), and a volume entitled "Julius, and other Tales, from the German" (Philadelphia, 1856). He edited for three years the "Diadem," a Philadelphia annual, has contributed a few articles to the "Christian Examiner" of Boston, and is the author of a large number of published occasional sermons; one of these, on the "Right of Property in Man," appeared in 1859. During the anti-slavery conflict Dr. Furness was a prominent abolitionist.

FURNIVALL, Frederick J. See supplement.

FURRUCKABAD, a city of British India, capital of a district of the same name, in the division of Agra, Northwest Provinces, 95 m. N. W. of Lucknow; pop. about 65,000. It is a walled town, and has clean wide streets, a number of which are shaded by trees. It has some good buildings, but most of the houses are mere mud hovels. The trade is considerable, the surrounding country being fertile and well cultivated. On the banks of the Ganges, 3 m. W., is Futteghur, formerly a British military station.—The district has an area of 2,122 sq. m. and a population of over 1,000,000. It is an alluvial flat, except in the S. W., where it is hilly, and is very fruitful. The principal productions are cotton, wheat, barley, maize, indigo, tobacco, sugar cane, and timber. It was annexed by the East India company in 1802.

FÜRST, Julius, a German orientalist of Jewish descent, born at Zerkowo, in the grand duchy of Posen, May 12, 1805, died in Leipsic, Feb. 9, 1878. He studied at Posen and Breslau, and in 1839 became lector at the university of Leipsic, and in 1864 professor. His historical, critical, and lexicographical works are numerous and widely used; the principal of them are: *Lehrgebäude der aramäischen Idiome* (1835); *Concordantia Librorum Sacrorum Veteris Testamenti Hebraica et Chaldaica* (1837-'40); *Hebräisches und chaldäisches Schulwörterbuch* (1842), expanded as *Hebräisches und chaldäisches Handwörterbuch* (1857-'61), and translated into English by Davidson (London, 1865-'6); *Geschichte der biblischen Literatur und des jüdisch-hellenischen Schriftthums* (2 vols., 1867-'70); and *Der Kanon des alten Testaments nach den Ueberlieferungen in Talmud und Midrasch* (1868). He also published *Cultur- und Literaturgeschichte der Juden in Asien* (1849); *Bibliotheca Judaica* (8 vols., 1849-'68); *Geschichte des Karäerthums* (2 vols., 1862-'5); and *Das peinliche Rechtsverfahren im jüdischen Alterthume* (1870). From 1840 to 1851 he edited *Der Orient*.—His son LUTVUS (born in Leipsic, May 27, 1840) is a physician, and author of *Das Märchen von den sieben Raben* (1864) and *Dornröschen* (1865).

FÜRTH, a town of Bavaria, in the province of Middle Franconia, at the confluence of the Rednitz and Pegnitz rivers, 4½ m. by rail N. W. of Nuremberg; pop. in 1871, 24,569. This railway, opened in 1835, was the first in Germany on which locomotive engines were used, and now extends from Frankfort to Munich. About 3,000 of the population are Jews, chiefly descendants of exiles from Nuremberg, who have a Talmud school, several minor schools and synagogues, two Hebrew printing establishments, and various benevolent institutions. One of the synagogues and the city hall are among the most noteworthy buildings. It is the most flourishing manufacturing town of Bavaria, with a large industry in looking-glasses, gold leaf, and articles known as Nuremberg wares. Gustavus Adolphus occupied Fürth in the summer of 1632, and in 1634 it was burned by the Croats.

FUSE, Safety, a tubular cord of cotton, rendered slowly combustible for communicating fire to the explosive used in blasting. The cavity in the centre of the cord is filled with some slow-burning compound, and the cord is then wound with tarred twine, and covered outside with a coating of tar. It is thus protected from moisture, and is made sufficiently firm and hard not to be cut by the fragments used in tamping. It burns about three feet in a minute. A method has been patented of introducing a combustible thread through the centre of the cord in the powder, with the view of providing another means of communicating the fire in case the powder is interrupted or the cotton of the tube does not continue to burn. For its use, see **BLASTING**.

FUSEL OIL, or *Amyl Alcohol*, a liquid colorless when pure, of offensive smell and burning taste, obtained by continuing the distillation of the fermented infusions used for the preparation of ardent spirits after the alcoholic portion has been drawn off. In this condition, however, it is mixed with water, from which it should be separated by a second distillation, the water coming over first. As this brings with it a portion of oil, it is to be set aside for the latter to separate, and form a layer on the surface. Ardent spirits contain fusel oil, particularly if the distillation has been pushed far. It is detected by redistilling whiskey, especially that obtained from potatoes, a milky fluid coming over at the last, from which the oil separates by standing; or by redistillation, water first coming over, and then the oil at its boiling point of 269° . Thus obtained, it is usually of a pale yellow, of specific gravity 0.818; at 4° below zero it congeals in crystalline leaves. It inflames only when heated to 180° . It unites with alcohol in all proportions, but has little affinity for water. The resins, fats, camphor, sulphur, phosphorus, &c., are dissolved by it. Upon the animal system it acts as an irritant poison; its vapor produces nausea, headache, and giddiness. Its composition is represented by the formula $C_5H_{11}O$; or, on the supposition of its being a hydrated oxide of amyle, its formula is $C_5H_{11}HO$. Fusel oil is used to some extent for burning in lamps, and for dissolving copal and other resins for varnishes, &c. Its presence is highly injurious to liquors, and when in sufficient quantity to be perceptible to the smell and taste indicates bad rectification or the use of damaged grain. It may be detected by agitating the liquor with water, and leaving it to stand for the oil to rise and appear at the surface. It is separated in rectifying by the introduction of some soft wood charcoal. Olive oil may also be added, and the mixture being well shaken the oils will afterward collect together at the surface, when they may be decanted and the spirits be again distilled.

FUSELI, John Henry, a painter and writer on art, born in Zürich, Switzerland, Feb. 7, 1741, died near London, April 16, 1825. His father was John Casper Füssli, also a painter. He received a good classical education in his native town, and in 1761 took orders. A pamphlet written by himself and Lavater, who was his schoolfellow, in which a public functionary was severely handled, was the cause of his leaving Zürich, and after spending some time in Vienna and Berlin he went to England, where for a time he supported himself by literary labors. Sir Joshua Reynolds, to whom he showed some of his drawings, advised him to devote himself to art, and he accordingly spent eight years in Italy among the works of the old masters. Here he changed his name to its Italian form, Fuseli, which he ever after retained. Returning to England in 1778, he executed a number of pictures for Boydell's "Shakespeare Gallery." In 1790 he was elected an

academician, and in 1799 he exhibited a series of 47 designs on a large scale from Milton's works. In the same year he became professor of painting in the academy. Among his literary labors was a translation of Lavater's "Aphorisms on Man." His "Lectures on Painting" was published in 1831, and translated into German by Eschenburg (1833). As a painter he possessed high imaginative powers, but his drawing was imperfect and unnatural. See his "Life and Writings," edited by John Knowles (3 vols., London, 1831).

FUSIBILITY, that property by which solid bodies are rendered liquid by the application of heat. It is probably possessed by all bodies, but some are so altered by chemical changes among their own elements or by the action of external bodies in contact, that they cease to retain their individual characteristics before their melting point is reached. Although it seems that in some crystalline organic compounds, and also in some of the fats, the fusing point varies after the body has been once melted, it is generally the case that the fusion takes place at a constant temperature for the same body, that this point is ascertained for many, and is given with each as one of the distinctive qualities. Carbon, however, resists this determination, and the assertions of its fusibility made by some experimenters are not generally admitted as establishing the fact. The range of the fusing point of bodies is very great, some existing in the solid state only far below the ordinary temperatures, while others require the most intense artificial heat to cause them to assume the liquid form. This is exhibited in the following table, which comprises many of the bodies thus arranged by Pouillet:

SUBSTANCES.	Degrees Centigrade.	Degrees Fahrenheit.
English hammered iron	1,600	2,912
Steel	1,800 to 1,400	2,272 to 2,552
Gray cast iron, second fusion	1,200	2,192
White cast iron, very fusible	1,050	1,922
Very fine gold	1,250	2,282
Standard gold	1,180	2,156
Silver, very pure	1,000	1,832
Bronze	900	1,652
Antimony	492	918
Zinc	380	700
Lead	320	608
Bismuth	202	396
Tin	230	446
Sulphur	114	237
Iodine	107	225
Phosphorus	48	109
White wax	68	154
Spermaceti	49	110
Ice	0	32
Oil of turpentine	-10	14
Mercury	-39	-38

The fusing point of oils, &c., is ascertained by introducing them together with a fine thermometer into small glass tubes, and placing these in water, which is gradually heated till the substances melt. The thermometer indicates the temperature. The method of determining the high melting points of the metals, &c., will be described in the article **PYROMETER**.

FUSIBLE METALS. See ALLOY, and BISMUTH.

FUSION DISK. See supplement.

FUSIYAMA, a volcano of Japan, in the chain which traverses Nippon, the loftiest peak in the empire, its height being 14,177 ft. It is

Volcano of Fusiyama.

covered with perpetual snow. It was formerly the most active volcano in Japan, but no eruption has taken place since 1707. Native historians assert that in the year 283 B. C. an extraordinary natural revolution produced in a single night both this mountain and the basin of the great lake Oitz Mitzoo; the elevation of surface caused by the former, as it rose from the bosom of the earth, being exactly counterbalanced by the depression which constitutes the latter. The Japanese hold this mountain in religious veneration. Some of its ravines are consecrated to the worship of Buddha, and every August crowds of devotees make pilgrimages to the idols in these spots.

FUSTIC, the dyewood of the *morus tinctoria*, a tree which grows to a great height in Brazil and the West India islands. A yellow dye is obtained by boiling the wood, and this is principally used for converting silks and woollens, cotton yarn, and light fabrics, already dyed blue, to a green. Its use is almost wholly for compound colors, bichromate of potassa and lead giving a better yellow. The yellow crystalline substance morine separates from a concentrated decoction of fustic by cooling. The wood is known as old fustic to distinguish it from the wood of the *rhus cotinus*, or Venice sumach, which is sometimes called young fustic, but more properly *fustet*, the name used by the French. The latter is a shrub cultivated in Italy and the south of France for purposes of dyeing and tanning. Its wood gives a yellowish decoction, which is used as an assistant to procure some particular tint. The color is too fugitive for use

alone. The principal fustine is extracted from this wood.

FUTTEGHUR, Fattygarh, or Fataghar, a town of British India, division of Agra, Northwest Provinces, situated on the right bank of the Ganges, in the district and 8 m. E. of the city of Furruckabad. It was once a considerable military establishment, but on the extension of the British frontier to the northwest the troops were withdrawn and many of the buildings have fallen into decay. The arsenal is protected by a fort built of mud, and most of the houses are of the same material. A few European merchants reside there. The chief native industry is the manufacture of tents.

FUTTEHPOOR, a city of British India, capital of a district of the same name, in the division of Allahabad, Northwest Provinces, on the line of the great trunk railway, 70 m. N. W. of Allahabad; pop. about 20,000. It is a large and thriving town, with some good houses, a well supplied bazaar, and an elegant mosque, and is the chief seat of the civil establishment of the district. The place existed before the 12th century. In the sepoy revolt it was captured by the rebels, but was retaken by Gen. Havelock on July 12, 1857.—The district has an area of 1,588 sq. m. and a population of about 700,000. The climate is remarkable for dryness and wide range of temperature. The principal productions are wheat, barley, cotton, opium, indigo, and sugar cane.

FUTTEHPOOR SIKRA, a town of British India, Northwest Provinces, in the district and 28 m. W. of the city of Agra; pop. about 5,000. It was enclosed by a high stone wall, 5 m. in circuit, with towers and battlements, by the emperor Akbar, whose favorite residence it was; but it contains now little more than heaps of massive ruins, a grand mosque, and a good bazaar. The mosque is built on a commanding hill, and is still in tolerable repair. Near the remains of a vast palace is a column 40 or 50 ft. high, built of composition moulded to imitate elephants' tusks; and outside the walls is a ruined embankment, 20 m. in circuit, which pent up the waters of a torrent till they formed a broad lake, on the margin of which was an amphitheatre for public games. These great works were constructed by Akbar about 1571.

FYZABAD, or Bangia, a town of British India, in the province of Oude, on the right bank of the Gogra, which in the rainy season is here sometimes $1\frac{1}{2}$ m. wide, 73 m. E. of Lucknow; pop. estimated at 100,000. It was founded by Saadat Ali Khan, first vizier of Oude, and was beautified by his successors, particularly by Surajah Dowlah, under whom it became the capital instead of the ancient city of Oude or Ayodha, adjoining it on the southeast. In 1775 the seat of government was removed to Lucknow. Since that time the deserted city has been falling to decay, and its population is rapidly decreasing. The only manufactures of consequence are cloth, hardware, and arms.

G

G, THE seventh letter in the Latin alphabet, bet, and in others derived directly from it, as the English, French, German, and Italian. In Hebrew, Greek, and some other alphabets of Phœnician origin, it is the third letter. In English it has two entirely distinct normal sounds: the hard, as in *get*, and the soft (also represented by J), as in *gem*. In pronouncing hard G, the root of the tongue is raised so as to close the openings from the pharynx into the nostrils, and then by expelling the breath, vocalized by the vibrations of the membranes of the larynx, the sound is formed. The chief difference between hard G and K is that in the latter the breath issues without vocalization. (For the mode of pronouncing the soft G, see J.) In English, G at the beginning of a word has the hard sound when immediately followed by *a*, *o*, or *u*. The words *gaol* and *mortgagor*, when thus spelled, form exceptions to this rule; but they are now commonly written *jail* and *mortgageor*. In *gu*, followed by another vowel, the *u* is generally silent, as in *guard* and *guide*; in a few words, mainly of Spanish origin, as *guano* and *guanaco*, it is pronounced as *gw* (in Spanish as *hw*, or simply *w*). In *gy*, except in a few terms of natural history, the *g* is pronounced soft, as in *gymnastics*. When followed by *e* or *i*, G may have either the hard sound, as in *get*, *gite*, or the soft, as in *gem*, *gin*; the general rule, to which there are many exceptions, being that it is hard in words derived from the Saxon, and soft in those from Greek, Latin, and French. At the end of a syllable G is hard unless softened by a final *e*, as in *rag*, *rage*; before an affix commencing with *i*, the softening *e* is usually omitted in writing, as in *refrangible*; if the affix begin with *a*, the silent *e* is retained, as in *changeable*. G enters into combination with several other consonants. In *gh*, at the beginning of a syllable, the *h* is silent, the *g* having its hard sound, as in *ghost*; at the end of a syllable *gh* is sometimes silent, as in *though*, and sometimes it has the sound of *f*, as in *trough*; in *hough* (now usually written, as pronounced, *hock*) it has the sound of *k*; in *ght*, the *t* only is sounded, as in *night*. In *gl* and *gr* both letters have their full sound, the *g* being hard, by whatever vowel followed. In *gn*, whether at the beginning or end of a syllable, the *g* is silent, as in *gnaw*, *deign*. *Ng* in English occurs only at the end of a syllable; it has but one sound, by whatever vowel preceded, as in *sang*, *sing*, *song*, and *sung*. In the Greek, Hebrew, and Germanic languages, and some others, G is hard in all positions. In the Romanic languages the rules for its hard sound are generally the same as in English, but its soft sound differs in character in French and Spanish. (See J.) It is never absolutely mute in any language but English, but is nearly so

in Spanish before *ua*, and as a terminal in Danish.—In the calendar G is the last dominical letter. In music, it is the name of the 5th diatonic interval, and the 8th string of the diatono-chromatic scale. It is the clef—altered into the adjoining form—of the violin or the treble. Capital G marks the deepest tone of the human voice, its octave being the small *g*. It is named *sol* in solmization.

GABELENTZ, *Hans Conon von der*, a German philologist, born at Altenburg, Oct. 18, 1807. He completed his studies at the universities of Leipsic and Göttingen, entered the service of Saxe-Altenburg, and was a member of the Frankfort preliminary parliament, and subsequently of the Erfurt parliament. He has published *Éléments de la grammaire mandchoue* (Altenburg, 1833); a translation into Mantchoo of the Chinese works *Se-shu*, *Shu-king*, and *Shi-king*, with a Mantchoo-German glossary (Leipsic, 1864); and a large number of minor writings on the Mordvin, Sirian, and numerous other idioms. He has also published a new edition of Ulfilas's Gothic Bible version (2 vols., 1848).

GABIROL. See SOLOMON BEN GABIROL.

GABOON (called also the Mpongo or Mpongwe in the language of the people at its mouth), a bay on the coast of west Africa, about lat. 0° 30' N., lon. 9° 20' E. It receives the united stream of the Olombo and the Rhamboe, and was formerly believed to be a large and powerful river; but it is simply an inlet of the Atlantic ocean, about 40 m. long, 9 m. wide, and from 10 to 60 ft. deep. In 1848 the French established a fortified factory on the coast of the Gaboon bay, and obtained gradually from the native chiefs the whole coast land from Cape Lopez, in lat. 0° 36' S., to the Laucie promontory, in lat. 0° 40' N. In 1867 the area of this colony was reported to be 8,000 sq. m. It had about 5,000 inhabitants and 1,000 troops. The latter were withdrawn during the Franco-German war of 1870-'71; and the protectorate of Grand Bassam and Assinie was abandoned by the French in 1872, because they could not control the native chiefs. At the beginning of 1874 there were no French authorities at Gaboon except the naval officers at the station, whose commander acts as governor. The settlement has substantial public buildings, stores, hospitals, a small dockyard, and a large depot of coals. French, English, American, German, and Portuguese missionaries reside here, as well as a French bishop. The Mpongwe language, which is spoken by the natives, has been reduced to writing, and is taught grammatically in the American missionary schools, and the French have translated part of the New Testament into it. The use of a corrupt English jargon is spreading. A number of slaves continue to be kept all along the

coast for domestic purposes. With a view of making the colony self-sustaining, an export duty has been recently imposed by the home government, which hampers trade.

GABORIAU, Émile, a French novelist, born about 1834, died in Paris, Sept. 29, 1873. His literary career began with sketches of theatrical, military, and fashionable life, published in the lesser Parisian journals. Collections of these sketches were published under the titles *Ruses d'amour*, *Les comédiennes adorées*, *Mariages d'aventure*, &c. In 1866 appeared his novel *Dossier N° 113*, which was followed in rapid succession by *Le crime d'Orcival*, *L'Affaire Lerouge*, *Les esclaves de Paris*, *La vie infernale*, *La corde au cou*, and other stories. *Ninette Suzor* and *L'Argent des autres* were published posthumously. Most of Gaboriau's works are elaborate detective stories, the gloomy romance of crime. The plots, which have been compared to those of Edgar A. Poe and Wilkie Collins, are wrought out with great skill and dramatic effect. *Dossier N° 113* and *Le crime d'Orcival* are considered the best. Two have been translated and published in the United States, under the titles "The Mystery of Orcival" and "The Widow Lerouge" (1878).

GABOURD, Amédée, a French historian, born about 1805, died in 1867. He began life as a journalist, and became chief of bureau in the ministry of the interior. He published many historical works in the ultramontane and monarchial interest, including *Histoire de la révolution et de l'empire* (10 vols., 1846-'51), *Histoire de France* (20 vols., 1857-'62), *Histoire de Paris* (5 vols., 1868-'5), and *Histoire contemporaine* (7 vols., 1864-'7).

GABRIEL (Heb., the mighty one of God), the angel sent to Daniel to interpret the vision of the ram and the he goat (Dan. viii.), and to communicate the prophecy of the 70 weeks (ix. 21-27); employed also to announce to Zacharias the birth of John the Baptist (Luke i. 11), and that of the Messiah to the Virgin Mary (i. 26). Though there is nothing in the Scriptures concerning his rank, he is accounted both by Jewish and Christian writers one of the archangels. According to rabbinical legends, he is the prince of fire, and presides over the ripening of fruit; he alone of the angels understood Chaldee and Syriac, and taught Joseph the 70 languages spoken at Babel; and he with Michael set fire to the temple at Jerusalem and destroyed the host of Sennacherib. Mohammedan writers esteem him one of the four most highly favored angels; he is styled the spirit of truth, and to him a copy of the Koran was committed, which he dictated in successive portions to Mohammed.

GABRIEL CHANNEL, a remarkable channel in Patagonia, between Dawson island and Tierra del Fuego, about lat. 54° 20' S., lon. 70° 40' W. It is 25 m. long and from $\frac{1}{2}$ to $1\frac{1}{4}$ m. wide, with shores nearly parallel. The N. shore is a ridge of slate rising to a sharp edge

and descending abruptly on the other side into a valley. The S. shore is a mass of mountains, two of which, Mts. Buckland and Sarmiento, are remarkable. The former, estimated to be 4,000 ft. high, is a pyramidal peak of slate; the latter, 6,800 ft. high, terminates in two peaks. The summit of the range between these mountains is an immense glacier, which forms as it melts many cascades that find their way into the channel. From the humidity of the climate these peaks are usually enveloped in fogs. Whirlwinds sometimes descend the S. ridge and burst with violence on the opposite shore.

GABRIELLI, Catarina, an Italian vocalist, born in Rome in 1730, died in 1796. She was the daughter of a cook employed by Count Gabrielli, who, being struck with the girl's remarkable voice, had her educated by Garcia and Porpora; and about 1747 she gave her first performance at Lucca, assuming the name of her protector. In 1750 she excelled to such an extent as Dido in Jomelli's opera of that name, that Metastasio engaged her as first prima donna for the Vienna opera. She was as celebrated for her amours, prodigality, and eccentricities as for her vocal and histrionic talent. In Parma she was the mistress of the infante Don Ferdinand, whose excessive jealousy impelled her to escape to St. Petersburg, where Catharine II. received her with open arms. She asked 5,000 rubles a month, and the empress remarking that this salary exceeded that of field marshals, Gabrielli proposed to her to make those warriors sing. After her return to Italy, the tenor Pacchiarotti was so overcome by her wonderful singing that he fled from the stage while performing with her in Venice in 1777. She had tempting offers from London managers, but would not go to England, where she feared that her whims would not be tolerated. Her last performances were at Milan, where she sang together with her rival Marchesi, and the opera-goers of that city formed two parties which led to disturbances. She ended her life in retirement in Rome.—**FRANCESCA GABRIELLI** (1755-'95) was another renowned vocalist, who became known as Gabriellina, to distinguish her from the preceding.

GABRIELLI, Niccolò, count, an Italian composer, born in Naples in 1815. He was for 14 years director of the music of ballets in the San Carlo theatre at Naples, and subsequently removed to Paris. He has produced ballets for the Grand Opéra, including *Gemma* (1854), *Les elfes* (1856), and *L'Étoile de Messine* (1861); and a comic opera of his was performed at the Opéra Comique in 1859.

GACHARD, Louis Prosper, a Belgian archivist, born in Paris, Oct. 12, 1800. He was a journeyman printer, joined the Belgian revolution of 1830, and was naturalized in Belgium in 1831. He was appointed archivist general, and commissioned to seek in the national and in foreign libraries for documents relating to

Belgian history, and in 1884 became secretary of the historical commission. He has most diligently explored the archives of Simancas in Spain, and others at home and abroad, and has published a great number of works and documents relating to the history of Belgium. Among the works edited by him are many volumes of correspondence of William the Silent, Charles V., Philip II., the duke of Alva, Margaret of Parma, &c., on the affairs of the Low Countries; official letters to the states general, and the acts of that body from 1576 to 1585; and *Relations des troubles de Gand sous Charles V., par un anonyme*, with 330 documents. In his work *Jeanne la Folle* (1869), he sets forth opinions opposed to those of Gustav Bergenroth concerning the mother of Charles V.

GAD (Heb., fortune), the seventh son of Jacob, elder son of Zilpah, Leah's maid, and whole brother of Asher. Of his youth there is no record. At the descent into Egypt he had seven sons.—The tribe of this name marched in the wilderness on the S. side of the tabernacle, and numbered 45,650. At the entrance into Canaan Gad and Reuben had many flocks, and obtained permission to settle E. of the Jordan, where the territory of Gad was central between Reuben on the south and Manasseh on the north, including the mountain district of southern Gilead and the lowland of the Jordan valley. The Gadites were restless half-nomads, and early extended over all Gilead; and later the names Gilead and Gad were used interchangeably. They were fierce and warlike, and some of them joined David during his outlawry. Among the famous members of the tribe were Jephtha and Barzillai, and probably the prophet Elijah. The isolation of the tribe, and perhaps the impulsive character of its people, weakened its influence in national affairs. Its territory was the battle field of Israel and Syria, and its population was carried away captive by Tiglath-pileser about 740 B. C.

GADARA, an ancient city of Palestine, the capital of Peræa (the country beyond or E. of the Jordan), and one of the ten cities called the Decapolis. It was about 8 m. S. E. of Lake Tiberias, and gave its name to the canton or district known as Gadaritica or the country of the Gadarenes. In Matthew it is called the country of the Gergesenes, but this term, as well as the existence of the city of Gergesa, is supposed to have been invented by Origen in the endeavor to reconcile various readings, as no such city can be traced. Though now wholly in ruins, in the time of Josephus Gadara was an important city, strongly fortified, having a court of justice, and in its vicinity several famous hot baths and medicinal springs, reckoned by the Romans inferior only to those of Baïæ. Among the remains of Gadara are tombs excavated in limestone rock, consisting of chambers about 20 ft. square, with recesses in the sides. The ruins of Um Keis reveal the splendor of ancient Gadara. It was captured by Vespasian, who reduced it to ashes. It be-

came later the seat of a bishop, but was abandoned after the Mohammedan conquest.

GADDI. I. **Gaddo**, a Florentine artist, born in 1249, died in 1312. He was an excellent worker in mosaic, and is considered the founder of the modern mosaic art. He also painted altarpieces. II. **Taddeo**, a painter, son of the preceding, born about 1300, died about 1360. His decorations of the Spanish chapel in the church of Santa Maria Novella at Florence, in competition with Memmi, are among the finest specimens of art produced in the 14th century. On one of the walls of this chapel are the reputed portraits of Petrarch and Laura. Taddeo was also distinguished as an architect. III. **Angelo**, son of the preceding, born about 1324, died about 1390. He was an imitator of his father and of Giotto, but did not improve in proportion to his abilities. He lived for many years in Venice, where he engaged in commerce, and has been considered the founder of the Venetian school.

GADE, **Niels Wilhelm**, a Danish composer, born in Copenhagen, Feb. 22, 1817. He commenced the study of music at a comparatively advanced age, and in a few years became an accomplished performer on the violin and pianoforte, after which he devoted himself to composition. In 1841 his overture entitled "Echoes of Ossian" received the prize of the Copenhagen musical union, and secured to him a royal stipend to travel and study his art abroad. He passed several years in Germany and in Italy, and greatly increased his reputation by a symphony in C minor. In 1844 he was appointed to succeed Mendelssohn in the direction of the Gewandhaus concerts at Leipsic. In 1850, having received the appointment of royal chapel master to the king of Denmark, he returned to Copenhagen, where he now lives. Among his published works are seven symphonies, a number of overtures, sonatas, quintets, and romances, *Comala*, a lyrical drama, "The Crusaders," a religious cantata, and the *Nibelungen*, an opera.

GADES. See CADIZ.

GADFLY, a dipterous insect, belonging to the genus *tabanus* (Linn.), with three-jointed antennæ and wide-spreading wings. The gadflies attack not only man, but cattle, horses, camels, and various ruminating animals. The most common species in the United States is the *T. atratus* (Fabr.), of a black color, with a whitish bloom on the back, like that of a plum; the eyes are very large, almost meeting at the top of the head, and of a shining purplish or bronze black color, with a jet-black band across the middle; it is about an inch long, with an expanse of wings of nearly two inches. The orange-belted gadfly (*T. cinctus*, Fabr.) is smaller and less common, black, with the first three abdominal rings orange-colored. A smaller and very common species is the *T. lineola* (Fabr.), which has a whitish line along the top of the hind body. There are many other American species, described and undescribed.

There are about 40 European species, for a knowledge of whose habits and metamorphoses we are principally indebted to De Geer. The species which so torments cattle is the *T. bo-rinus* (Linn.), about an inch long; the thorax and abdomen are dark brown, the former with yellowish hair, and the latter with a reddish yellow cross band on the hinder edge of the segments, and bright yellow triangular spots; abdomen yellowish gray, with black triangular spots; thighs dark brown, and tibiae bright yellow. These insects appear about the end of June, and continue their attacks through summer; the proboscis, though not very long, is armed with six very sharp needles, by which they can pierce the thickest hide. In the allied genus *chrysops* (Meigen), or golden-eyed gadflies, may be mentioned the *C. cusc-tiens* (Meig.), about one third of an inch long, common in Europe in meadows and pasture lands, stinging both men and horses very severely; the yellowish brown thorax is marked with three long black stripes; wings white with blackish brown spots; abdomen yellowish. American species are *C. ferrugatus* (Fabr.), black, and *C. vittatus* (Wied.), striped black and yellow; they are found in woods and thickets in July and August. The genus *hamatopota* (Meig.) contains the troublesome gadfly called *elag* in Scotland; this, the *H. pluvialis* (Meig.), is about the size of the common house fly; the large eyes are greenish, with four undulating brown bands running through each of them; the body is gray, with brownish cross stripes; the wings gray, spotted with brown. It attacks man, cattle, and especially horses, in sultry weather just before rain; the wounds are painful at the time, but are not followed by any lasting burning or itching.—The name of gadfly is also given to several species of *ostrus*, especially to that which deposits its eggs about the knees and sides of the horse, and which, conveyed into the stomach, constitute the disease known as bots. (See Bots.)

GADSDEN, a N. county of Florida, bordering on Georgia, bounded E. by the Ocklockonnee river and W. by the Appalachicola; area, 700 sq. m.; pop. in 1870, 9,802, of whom 6,038 were colored. It is traversed by the Jacksonville, Pensacola, and Mobile railroad. It has an uneven surface and a fertile soil. The chief productions in 1870 were 145,165 bushels of Indian corn, 16,075 of oats, 40,980 of sweet potatoes, 3,258 bales of cotton, 118,799 lbs. of tobacco, 32,785 of rice, 42,384 gallons of molasses, and 60 hogsheads of sugar. There were 691 horses, 603 mules and asses, 7,550 cattle, and 7,860 swine. Capital, Quincy.

GADSDEN, Christopher, an American statesman, born in Charleston, S. C., in 1724, died there, Aug. 28, 1805. His father having lost his large estate in play with Admiral Anson, the son engaged in mercantile business with such success as to recover it all by purchase. He was one of the boldest in denouncing British oppression from the time of the stamp act, and is

said to have been the first to speak of American independence. He was a delegate to the stamp act congress, which assembled in New York in 1765, and to the first continental congress in 1774, in which he urged an immediate attack upon Gen. Gage at Boston; became senior colonel and afterward brigadier of three South Carolina regiments in 1775; was actively engaged at the siege of Charleston in 1776; was one of the framers of the constitution of South Carolina, adopted in 1778; resigned his military commission in 1779; and as lieutenant governor of the state signed the capitulation when Charleston was taken by Sir Henry Clinton in 1780. Shortly after, in violation of the terms of capitulation, he was arrested with 77 other influential public men, hurried on board a prison ship, and conveyed to St. Augustine. He alone of the prisoners refused to enter into any engagements to secure a degree of freedom on parole, and was therefore incarcerated for 42 weeks in the dungeon of the castle of St. Augustine. Being exchanged, he was sent to Philadelphia, and after his return to Charleston, as member of the state legislature, he opposed the confiscation of the property of loyalists. He was elected governor of the state in 1782, but declined the honor, preferring to retire to private life.

GADWALL, a fresh-water or river duck of the subfamily *anatinae*, and the genus *chauliastmus* (Gray). In this genus the bill is as long as the head, the lamellae distinctly visible below its lower edge, and its color black; the head and neck brownish white, each feather spotted with dusky, and the top of the head generally with a reddish tinge; lower neck, breast, back,

Gadwall (*Chauliastmus streperus*).—1. Male. 2. Female.

and sides banded with narrow bars of black and white; rump and tail coverts black; greater wing coverts velvet black, middle chestnut, and speculum white with a black border. From its general color it is often called the gray duck. The length is about 22 in., the extent of wings

85, and the weight about 1½ lb. The only species described is the *C. streperus* (Gray), which is generally considered the same in America and Europe. The gadwall is a good diver and swimmer, and walks uncommonly well; it is a rapid flier, with a whistling noise of the wings; in its excursions on land it nibbles the tender grass, and will eat acorns, seeds, and grain. Experiment has proved that this species is capable of domestication, the peculiarity of the plumage being retained.

GÆL, or **Gall** (Gaelic, *Gaedhil*, *Gadhel*, or *Gaoidheal*), the plural of *Gal* or *Cal* (skin to Latin *celo*, to hide, as the people dwelt or were hidden in forests; or more probably signifying wanderer), the name of the northern and western branch of the great Celtic family of nations, whose other branch is formed by the Kymri or Cymri. The Gael inhabit the Scotch highlands and Ireland, and distinguish themselves as Gael Albinach, or Gael of Al-bion, and Gael Erin-nach, or Gael of Erin (from *ar* or *iar*, west, and *ie*, island; Romanized into Ierne and Hibernia). Both these divisions are called Erse, the former by the Scotch lowlanders, who derive them from Ireland. The descendants of the Kymri dwelling in Wales are called Gwyddel by the Gael, while those in France are named Breiziz (Britons); and those of Cornwall (*corn*, *cairn*, rock, and *gal*) ceased in the 18th century to speak their peculiar dialect. Gaedhilic or Gaoidhilg is the epithet especially appropriated to the Irish and to their tongue, and Gaelic especially denotes both the highland Scotch and their language. Caledonia is composed of *Cal* and *dun* or *don*, mountain; Gaeldoch of *Gael* and *doch*, land; both being names of Scotland; but Gaolldoch or strangers' land is the distinctive name of that part of Scotland which is inhabited by non-Celtic people. (See CELTS, and CELTS, LANGUAGES AND LITERATURE OF THE.)

GÆTA (anc. *Caeta*), a fortified city of S. Italy, in the province of Caserta, on the gulf of Gaëta, an arm of the Mediterranean, 72 m. S. E. of Rome; pop. of the city, including its suburbs, about 8,000, and of the commune about 16,000. It is neatly though irregularly built. The principal public edifices are the citadel, one of the strongest fortresses in Italy, and formerly the key of the kingdom of Naples, and the cathedral, a handsome symmetrical structure, with a fine tower. On the high-

est point of the promontory of Gaëta is the tomb of Lucius Munatius Plancus. Among its antiquities is a 12-sided column with the 12 directions of the wind inscribed upon it in Latin and Greek. The *rocca Spaccata* is shown as having split in two for grief when hearing St. Francis preach about the death of Christ. Through the crevice of this rock a flight of stairs leads to a chapel, built in commemoration of the miracle.—Gaëta is said to have been founded by Æneas, in honor of his nurse Cajeta, who died on the shore. It certainly existed before Rome. In the 5th century it fell into the power of the Ostrogoths, and afterward into that of the Byzantine empire. In the time of Charlemagne it was known as an independent republic. It was subsequently ruled by dukes. The Normans took it in the 11th century. It was fortified by Alfonso V. of Aragon, who had seized it by surprise, and Charles V. enlarged it. In 1707 it was be-



Gaëta.

sieged by the Austrians; in 1784 it succumbed to the united efforts of the French, Spaniards, and Sardinians; in 1799 it was taken by the French, and in 1806 by the troops of Joseph Bonaparte, then king of Naples. The Austrians reduced it in 1815, and made it part of the kingdom of Naples. Pius IX. escaped from Rome to Gaëta Nov. 24, 1848, and resided there till April, 1850, when he returned to Rome. Francis II. also fled to this place in 1860, and shut himself up in the citadel with his army; but after a siege of three months Gaëta surrendered (Feb. 13, 1861) to Victor Emanuel's forces under Cialdini, Francis taking refuge on board a French frigate.

GÆTULIA, an ancient country of Africa, S. of Mauritania and Numidia, bounded E. by hills separating it from the country of the Garamantes, W. by the Atlantic ocean, and S., according to Pliny, by the river Niger. Nearly all of this region was included in the Sahara or

great desert, the W. oasis of which, and perhaps some portions of the fertile belt on its N. margin and of the basin of the Niger, were inhabited by the Gætuli. They were one of the two great aboriginal races of N. Africa, W. of Egypt, the other being the Libyans, and had formerly dwelt on the coast of the Mediterranean, but were expelled by the Mauritaniens and Numidians, and driven S. of Mt. Atlas. They were nomadic, warlike, and savage, living on milk and flesh, clothed with skins, and without regular government. They were divided into several tribes, one of which, the Melanogætuli, were nearly black from intermingling with the Nigritæ on the south. In the Jugurthine war they served as cavalry against the Romans, but afterward a body of them joined the army of Marius; and from this period to the close of the civil wars we frequently find them serving as auxiliaries with the legions. They were sometimes troublesome to the Romans, and in the reign of Augustus an army under the command of Cornelius Cosus Lentulus had to be sent against them. The barbarians were vanquished, and the general obtained a triumph and the surname of Gætulicus. The Gætuli appear to have been the ancestors of the modern Berbers.

GAGARIN, the name of a princely Russian family, deriving its origin from the rulers of Starodub, having its seat in Moscow, and of which the most distinguished members are the following. **I. Matfei Petrovitch**, governor general of Siberia under Peter I., was executed in June, 1721, on the charge of having conspired to make himself sovereign of that province. **II. Alexander Ivanovitch**, a general officer in the Russian army, distinguished himself in the Caucasus and the Crimea, and in 1857, while governor general of Kuttai, was assassinated by the prince of Suanethi, which province he was endeavoring to annex to the empire. **III. Pavel Pavlovitch**, an influential statesman under Alexander II., was prominent as a member of the council of emancipation; from 1864 to 1869 presided over the council of ministers and that of the empire; and subsequently he was associated in the latter office with the grand duke Constantine until his death in St. Petersburg, March 4, 1872. **IV. John (IVAN)**, a Jesuit writer and missionary, born in Moscow, Aug. 1, 1814. Like most of the younger members of his family, he embraced a diplomatic career, and was secretary of the Russian embassy in Paris, when he joined the Roman Catholic communion, and entered the society of Jesus Aug. 13, 1843. After receiving holy orders, he was appointed professor of theology in the Jesuit seminary at Laval, and in 1857 founded conjointly with Père Charles Daniel a serial entitled *Études de théologie, de philosophie et d'histoire*, at first published quarterly, then monthly, and finally fortnightly. Father Gagarin spent several years in Constantinople, where he founded the society of St. Dionysius the Areopagite, which aims at reuniting the Greek

and Latin churches. He has published a large number of pamphlets, mainly relating to the history of the Græco-Russian church and to its reunion with that of Rome, the most recent of which are *Constitution et situation présente de toutes les Églises de l'Orient* (Paris, 1865), and *Le clergé russe* (Brussels, 1871; English translation, London, 1872).

GAGE, a S. E. county of Nebraska, bordering on Kansas, and intersected by Big Blue river; area, about 900 sq. m.; pop. in 1870, 3,359. The surface is diversified; the soil fertile. The chief productions in 1870 were 129,233 bushels of wheat, 146,180 of Indian corn, 42,586 of oats, 20,122 of potatoes, and 5,316 tons of hay. There were 1,088 horses, 835 milch cows, 1,527 other cattle, 1,979 sheep, and 2,020 swine. Capital, Beatrice.

GAGE, Thomas, the last royal governor of Massachusetts, born in England, died there in April, 1787. He was an active officer during the seven years' war, was appointed governor of Montreal in 1760, and succeeded Gen. Amherst in 1763 in the chief command of the British forces in America. Being appointed to supersede Hutchinson as governor of Massachusetts, he arrived in Boston in May, 1774, while the people of that colony were preparing to resist the port act. Though personally esteemed, he inspired the public with neither confidence nor fear. He was instructed to seize and punish Samuel Adams, Hancock, and Warren, but durst not even attempt their arrest. As precautionary measures he seized the powder in the public magazine in Charlestown (Sept. 1), and began to fortify Boston. He planned the expedition to Concord which resulted in the battle of Lexington (April 19, 1775), and on June 12 established martial law throughout Massachusetts, and proscribed Samuel Adams and John Hancock by name, offering pardon to all other rebels who would return to their allegiance. After the battle of Bunker Hill (June 17, 1775) Gage was superseded by Gen. Howe, and sailed for England on the following Oct. 10.

GAIL. I. Jean Baptiste, a French author, born in Paris, July 4, 1755, died there, Feb. 5, 1829. He acquired eminence as a Hellenist, and became in 1791 adjunct and in 1802 titular professor of Greek literature in the collège de France. He gave for many years gratuitous instruction to a number of poor students whom he boarded and lodged in his house. He translated and edited many Greek classics, and published Greek grammars. Among his numerous works are *Le philologue* (22 vols., 1814-'28), and *Géographie d'Hérodote* (2 vols., 1823). **II. Edme Sophie**, a musical composer, wife of the preceding, born at Méhun in 1776, died in Paris, July 24, 1819. She was a daughter of the surgeon Garre, and married Gail in 1794, but soon separated from him and devoted herself altogether to music, studying under Menozzi and giving concerts in southern France and in Spain. On returning to Paris, she be-

came famous by her ballads, while she studied under Fétis and other masters. Her comic opera *Les deux jaloux* became exceedingly popular in 1813, but her subsequent operas were less successful, though Bofeldien was her collaborator in *Angéla*. *La sérénade*, however, was much applauded at the Théâtre Feydeau in 1818.

GAILLAC, a town of France, in the department of Tarn, on the right bank of the river Tarn, an affluent of the Garonne, 12 m. W. by S. of Albi; pop. in 1866, 7,870. It is in a fertile region, abounding in vineyards, and surrounded by suburbs, one of which contains a large square, but the streets are exceedingly narrow. It contains two old churches, a communal college, a military prison, and an agricultural society, and various industrial establishments. Gaillac produces white and red wines of superior quality, the latter celebrated for enduring long sea journeys.

GAILLARD, Gabriel Henri, a French historian, born at Ostel, near Soissons, March 26, 1726, died at St. Firmin, near Chantilly, Feb. 18, 1806. He studied law, but devoted himself to literature, and was the lifelong intimate friend of Malesherbes. He spent the latter part of his life in the utmost seclusion, living in the most frugal manner. His principal works are histories of Francis I. (8 vols.), of Charlemagne (4 vols.), of the rivalry between France and England (11 vols.), and between France and Spain (8 vols.); *Dictionnaire historique* (6 vols., 1791), in the *Encyclopédie moderne*; and *Mélanges littéraires* (4 vols., 1856-'7). Several of his works passed through new editions. Though his arrangement of historical events is loose and his style rather stilted, he is regarded as a conscientious and painstaking historian.

GAINES. I. Edmund Pendleton, an American general, born in Culpeper co., Va., March 20, 1777, died in New Orleans, June 6, 1849. He entered the army as ensign in 1799, was for many years actively employed in frontier duty, and was instrumental in procuring the arrest of Aaron Burr. About 1811 he resigned his commission, but at the commencement of the war of 1812 returned to the army, with which he remained connected until his death. At the battle of Chrysler's field, Nov. 11, 1813, he rendered important services by covering the retreat of the American forces with his regiment, the 25th, and he subsequently commanded at Fort Erie when the night assault by the British troops under Gen. Drummond was repulsed. For his conduct during the siege of this place, where he was severely wounded, he was made brevet major general, and received the thanks of congress and a gold medal. He received similar testimonials from the states of Virginia, Tennessee, and New York. He was engaged in the Creek and Seminole wars, after which he had routine duty only. **II. Myra Clark**, an American heiress, wife of the preceding, born in New Orleans

about 1805. Her father, Daniel Clark, born in Sligo, Ireland, about 1766, emigrated to New Orleans, where he inherited his uncle's property in 1799. He was United States consul there before the acquisition of Louisiana, and represented the territory in congress in 1806-'8. He died in New Orleans, Aug. 16, 1813, and his estate was disposed of under the provisions of a will dated May 20, 1811, which gave the property to his mother, Mary Clark, who had followed him to America and was living at Germantown, Pa. His business partners, Relf and Chew, were the executors. Clark was reputed a bachelor, but was known to have had a liaison with a young French woman of remarkable beauty, Zulimo des Granges, during the absence of her reputed husband in Europe. Two daughters were born of this connection, one at Philadelphia, in April, 1802, the other (Myra) in New Orleans, probably in 1805. The latter was taken to the house of Col. Davis, a friend of Clark's, nursed by a Mrs. Harper, and in 1812 went with Davis's family to reside in Philadelphia, where she passed by the name of Myra Davis. In 1830 Davis, being then in the legislature, sent home for certain papers; and Myra, in searching for them, discovered some letters which partially revealed the circumstances of her birth. In 1832 she married W. W. Whitney of New York, who in following up the discovery received from Davis an old letter which gave an account of a will made by Clark in 1813, just before his death, giving all his large estate to Myra and acknowledging her as his legitimate daughter. Whitney and his wife went to Matanzas, Cuba, saw the writer of the letter, and, after collecting other evidence, instituted suits to recover the estate, which included some of the most valuable property in New Orleans. On the trial of one of these causes, Mrs. Harper testified that four weeks before his death Clark showed her the will he had just made in favor of Myra, permitting her to read it from beginning to end, and acknowledged the child's legitimacy. Baron Boisfontaine testified that Clark told him the contents of the will and acknowledged the child. On this and other similar evidence the lost or destroyed will was received by the supreme court of Louisiana (Feb. 18, 1856) as the last will of Daniel Clark, though of the document itself no vestige had ever appeared. But by the law of Louisiana a testator cannot make devises to his adulterine bastard. It was proved by the testimony of two sisters of Myra's mother, one of whom swore she was present at the ceremony, that Clark privately married her in Philadelphia in 1803, a Catholic priest officiating; she having previously learned that Des Granges, her supposed husband, had a prior wife living, and was therefore not legally her husband. Clark's contemplated acknowledgment of the marriage was said to have been frustrated by suspicions of her fidelity; and, deserted by him, she contracted a third marriage. In another suit the United States supreme

court decided that the fact of the marriage and legitimacy was established. Mrs. Whitney survived her husband, married Gen. Gaines in 1839, and survived him also. In 1856 she filed in the supreme court of the United States a bill in equity to recover valuable real estate then in the possession of the city of New Orleans, and a decision in her favor was rendered at the December term of 1867. This substantially concluded one of the most celebrated causes ever tried. The value of the property claimed was estimated in 1861 at \$35,000,000, of which Mrs. Gaines had up to 1874 obtained possession of \$6,000,000, and numerous actions for ejectment were still in progress. The testimony, documents, and opinions in these suits cover 8,000 closely printed pages. A good history of the affair is contained in Wallace's "Cases argued and adjudged in the Supreme Court of the United States," vol. vi., p. 642.

GAINSBOROUGH, a town of Lincolnshire, England, on the right bank of the Trent, which is crossed here by an arched stone bridge, 16 m. N. N. W. of Lincoln; pop. in 1871, 7,564. It contains a fine parish and a new district church, a grammar school, and a literary institute. The quaint old Elizabethan hall or manor house, supposed to have been partly built by John of Gaunt, and recently restored, contains the mechanics' institute and assembly rooms and the theatre. Gainsborough shares with Hull in the Baltic trade; the river Trent is navigable for ships of 200 tons, and various canals afford communication with almost all important commercial centres; the outward and inward vessels number annually about 500, with an aggregate tonnage of upward of 25,000. The principal manufacture is that of linseed oil, and ship building, matting, rope making, and other industries are actively carried on.

GAINSBOROUGH, Thomas, an English landscape and portrait painter, born in Sudbury, Suffolk, early in 1727, died in London, Aug. 2, 1788. At a very early age he manifested a taste for drawing. About 1744 he was placed under the instruction of the engraver Gravelot and the painter Hayman, and soon began to paint landscapes and portraits. But his position did not improve until his marriage in 1746 with a young lady named Burr, of striking beauty and considerable fortune. He then resided successively in Ipswich and Bath, and in 1774 returned to London, where some portraits of members of the royal family at once gave him a name and ample employment. He passed the remainder of his life in London, where Sir Joshua Reynolds, his great rival and friend, had settled before him. In 1768 he was chosen one of the original 36 academicians, and from that time until 1784 he sent numerous pictures to the academy. As a landscape painter Gainsborough achieved the highest excellence, and was the first in England to show any real originality. The "Life of Thomas Gainsborough," by George William Fulcher, appeared in London in 1856.

GAIRDNER, William, a British physician, born near Ayr, Scotland, Nov. 11, 1793, died in Avignon, France, in April, 1867. He graduated in medicine at Edinburgh in 1813, and until 1822 spent most of his time on the continent. He then settled in London and commenced practice. He was distinguished for his observations on the medical uses of iodine, and published a treatise on this subject. His "Gout, its History, Cause, and Cure" (London, 1849) has long been a standard work.

GAIUS, Gajus, or Caius, a Roman jurist, who flourished in the 2d century of our era, during the reigns of Hadrian, Antoninus Pius, and Marcus Aurelius. Of his personal history little or nothing is known, and even the spelling of his name has been the subject of controversy. From the references contained in the Digest it appears that he was the author of more than 15 works, of which the Institutes was by far the most important. This is supposed to have been the first work of the kind not compiled from previous sources, and to have afforded the first instance of a popular manual of Roman law in the sense of modern elementary text books. After a lapse of four centuries from its publication it was incorporated almost bodily into the celebrated Institutes prepared by the order of Justinian. In 1816 Niebuhr examined a palimpsest in the cathedral library at Verona, containing 251 pages, of which one detached and undefaced leaf of two pages had been described and partly published by Scipio Maffei 60 years before, with a conjecture that it was part of a compendium of Justinian's Institutes. With this exception the whole original manuscript had been washed and sometimes scratched out and overlaid with the epistles of St. Jerome, and 63 pages had been written over a second time; yet Niebuhr succeeded in restoring and deciphering a portion of it. He communicated the results of his labors to Savigny, who published them, together with a learned note suggesting that the ancient text of the parchment was the lost Institutes of Gaius. The royal academy of Berlin in 1817 sent two accomplished civilians, Göschen and Bethmann-Hollweg, to Verona, who, after incredible labor in deciphering the characters on the parchment, succeeded in making a transcript of the original writing, with the exception of three leaves and a few scattered passages which were illegible. A comparison of the work with the quotations in the Digest, and its agreement with the Institutes of Justinian, confirmed Savigny's conjecture, and the discovery, by clearing up difficulties in the interpretation of ancient jurisprudence before regarded as hopeless, formed an era in the study of Roman law. Several editions of the text have been published, that of Göschen (improved by Lachmann) of 1842 being considered the best; and commentaries on detached portions by Van Assen, Heffler, Klenze, Böcking, and others, have appeared. The text, with an English translation and commentary

by Tomkins and Seniors, was published in London in 1869; a translation with notes, by Abdy and Walker, in 1870; and a translation and commentary, by Edward Poste, at Oxford in 1871.

GALACTODENDRON. See COW TREE.

GALACTOMETER (Gr. *γάλα*, gen. *γάλακτος*, milk, and *μέτρον*, measure), an instrument for determining the specific gravity of milk. The common hydrometer may be used for this purpose, but a better instrument is that called the centesimal galactometer, invented by M. Dinocourt. This is a glass tube made to float upright in the liquid, and surmounted with a stem upon which are two scales, one intended to be used in skim milk, the other in milk from which the cream has not been removed. The normal range of each quality is designated upon one of the scales, and the divisions above are intended to mark hundredths of water that has been added. Though the specific gravity of genuine milk commonly is found between 1.026 and 1.081, the determination of this is a very uncertain test of its purity. Cream being specifically lighter than milk, its removal leaves the fluid comparatively heavier; water might be added to this, and the specific gravity be thus brought to that of genuine milk. The instrument therefore should be used only in connection with another called the lactometer, the object of which is to determine the proportion of cream present. This being known, and the specific gravity ascertained with the accuracy due to the graduation of the galactometer, the quality of the milk can be more correctly determined than by other instruments.

GALAGO. See LEMUR.

GALANGAL, the root of an unknown Chinese plant, probably belonging to the ginger family. Two kinds, the larger (*Alpinia galanga*) and smaller, are described. It resembles ginger in many respects, and is but little employed in medicine, but occasionally forms an ingredient in some quack formula, or is peddled under some assumed name as a specific for diarrhoea, cholera, &c. It contains a volatile oil, a resin, and various extractive matters. The only active principles are the oil and resin. It was known to the Greeks and Arabians, and its aromatic and stimulant properties led at one time to its extensive use. Recently discovered agents of similar action but more agreeable taste have superseded it. It may be given in substance or infusion. The dose of the former is about 20 grains; of the latter, two or three fluid ounces.

GALÁPAGOS, a group of islands lying in the Pacific ocean, under the equator, about 600 m. from the coast of Ecuador, to which politically they belong. They were discovered by the Spaniards, who named the group from the numerous land tortoises, called *galápagos* in Spanish; but the single islands have received English names. In the latter part of the 17th century they became a great rendezvous of the buccaneers, who resorted to them for re-

freshments and to fit out expeditions against the Spaniards. The group consists of six principal islands, nine smaller ones, and many islets, some being mere rocks. Its northern and southern limits (including Culpepper and Wenman islands) are lat. 1° 40' N. and 1° 27' S., and it lies between lon. 89° 30' and 92° 5' W. The largest island, Albemarle, is about 60 m. long and about 15 broad; it is also the most elevated, reaching a height of 4,700 ft. The next in size is Indefatigable island, after which come Narborough, James, Oatham, and Charles. All the islands are volcanic, and with the exception of a few ejected fragments of fused granite, found by Darwin, every part consists of lava, volcanic tuff, basalt, and other eruptive rocks. The general shape of the islands is that of the majority of oceanic volcanoes, a large dome, surmounted by a wide and shallow crater, and the sides furrowed by numerous lava streams. Small cones of eruption are occasionally seen on the flanks, but are particularly numerous near the foot; Darwin estimates that there are 2,000 of them in the group. The S. W. point of Albemarle island is studded with them. Volcanic activity seems to be nearly extinct at present. On Narborough island two craters were seen in action by H. M. S. Tagus in 1814, and a terrific eruption is described in Morrel's voyage in 1825. Darwin saw in 1835 a small jet of smoke issuing from one of the great craters of Albemarle island. It is certain that on these two islands the lava streams look much fresher than on the others, and the vegetation is much more scanty. As a rule, the volcanoes of the eastern islands appear to have been extinct for a much longer time than those of the western. The climate is remarkably temperate, considering the position directly under the equator. This is due to the low temperature of the Peruvian current, which coming from the antarctic regions strikes here to the westward after having followed closely up the coast of South America. This current meets here a part of the equatorial current starting from the bay of Panama, so that the curious phenomenon was observed by H. M. S. Beagle of the water being 60° on the southern side of Albemarle island and 80° on the northern. The lower parts of the islands are remarkably arid and destitute of water; but the summits, which are generally covered by clouds, receive from them sufficient moisture to sustain an abundant vegetation and to be susceptible of cultivation. The rainy season is from November to March, but cannot be compared to the continental rainy season. Severe droughts occur occasionally; in 1872, previous to the visit of the United States steamer Hassler, more than 2,000 head of cattle had perished from that cause on Charles island. The Galápagos had no permanent inhabitants till 1832, when a party of exiles were brought over from Ecuador by Don José Vilamil. The largest settlement is on Charles island, and is called Floriana, at one time containing

from 200 to 800 inhabitants. At the time of the Hassler's visit the whole settlement had dwindled down to a so-called governor and about a dozen peons, who were very destitute, owing to the abandonment of the islands as a place of call for whalers and other vessels, which can no longer procure the supplies of turtles for which the islands were once famous. Besides Charles island, the only other inhabited island is Chatham.—The zoölogy and botany of these islands possess a peculiar interest, first revealed by the researches of Darwin. Not only is there a large number of animal and vegetable forms not found in any other part of the world, but some of them are confined to single islands of the group, and, what is still more extraordinary, strongly marked varieties, if not different species, of the same genus replace one another in islands not far apart. Considering the evidently recent formation of the islands, the problem of the origin of organic life presents itself here in a most striking manner. Both the fauna and the flora have a most undoubted western American character. Of mammalia there are no indigenous terrestrial representatives; a rat and a mouse found on some of the islands were probably introduced. Seals, however, are very plentiful. Cattle, pigs, and goats have been introduced on Charles and Chatham islands. About 26 species of birds are known to inhabit this group. Most of the water birds and a few of the land birds are American. The extreme tameness of these birds has always been a wonder to visitors. The reptiles are of great interest. It has been mentioned that the islands were named from the land tortoises, *testudo nigra*, formerly so abundant that single ships are said to have taken away as many as 700. They were found weighing several hundred pounds, but at present they have greatly diminished in number, and large ones are seldom seen. Of lizards there are three or four species, one or two small and belonging to a South American genus, and two large ones belonging to the genus *amblyrhynchus*, confined altogether to these islands. Of these, one (*A. cristatus*) is the only marine saurian of our epoch. It inhabits the shores of all the islands, swimming out to sea and feeding on seaweed. The other species (*A. Demarlii*) is terrestrial and herbivorous, inhabiting burrows or crevices in the lava; it is confined to the central islands of the group. Both attain a size of 3 or 4 ft., but the terrestrial is somewhat the smaller. A small snake of a South American species is abundant. Sea turtles are also very numerous. The fishes are mostly of South American types, but are not yet sufficiently known. Insects are scarce and small. One half of the shells, according to Mr. Cuming, are peculiar to the islands, the other half partly South American, partly common to the central parts of the Pacific. Coral reefs do not exist here; but pieces of coral of two species, found also in Panama, were picked up on the beaches by the Hassler

expedition. The scanty vegetation is so small-leaved in general in the lower parts as to present scarcely any appearance of verdure. Two large cactuses, a *cereus* and an *opuntia*, are arborescent and give a strange character to the landscape. Near the tops of the mountains the vegetation is more luxuriant, and grasses and ferns abound, but there are none of the palms or tree ferns, so characteristic of the tropics.

GALASHIELS, a burgh of Scotland, partly in Selkirkshire and partly in Roxburghshire, on both sides of the Gala, 27 m. S. E. of Edinburgh; pop. in 1871, 6,438 (in 1801, 1,214, and in 1881, 2,209). The place is of considerable antiquity, but the wool manufactures, to which it owes its recent progress, have only since the beginning of the present century been carried on to any great extent. The town is well built, has six principal streets, and is lighted with gas.

GALATA. See CONSTANTINOPLE.

GALATEA. See AOLS.

GALATIA, an ancient province of Asia Minor, bounded N. by Bithynia and Paphlagonia, E. by Pontus, S. by Cappadocia and Lycæonia, and W. by Phrygia, of which it was once a part. The Halys traversed it from S. to N. It was called Gallo-Græcia or Galatia from the Gauls, who conquered this region and settled in it in the latter part of the 3d century B. C. They were divided into three great tribes and twelve tetrarchies, each under a separate chief. They aided Antiochus the Great against the Romans, but the latter against Mithridates, for which one of their tetrarchs, Deiotarus, was made king, receiving also Pontus and Armenia Minor. He fought with Pompey against Cæsar at Pharsalia, was accused of an attempt on the life of Cæsar and defended by Cicero, and at the close of his life sided with Brutus and Cassius. On the death of his successor, King Amyntas, the country was annexed to the Roman empire, 25 B. C. Its inhabitants, though intermixed with Greeks, retained their native Gallic language at the time of St. Jerome, and, according to him, were in the 4th century the only people in Asia Minor who could not speak Greek. Roman writers call the inhabitants Galli. Theodosius I. divided the province into Galatia Prima and Galatia Secunda. Famous cities of Galatia were Ancyra, now Angora, Pessinus, and Gordium, where Alexander the Great cut the knot. Galatia forms now part of the Turkish vilayet of Angora.—The Galatians were less effeminate and less debased by superstition than the natives of Phrygia, and therefore more ready to receive the gospel. Paul first preached Christianity and organized churches in Galatia. He was there once with Silas and Timothy (Acts xvi. 6), about A. D. 53, and again several years later, on his return from Corinth (Acts xviii. 23).

GALATIANS, Epistle to the, a letter addressed by the apostle Paul to the churches of Galatia, and forming one of the canonical books of the New Testament. It is one of those Pauline

epistles whose authenticity has never been questioned by the critical theologians, and which is therefore of prime importance for establishing the theological views of the apostle. It consists of two parts. The first (chap. i. to v. 12), chiefly doctrinal, vindicates the apostolic commission of Paul, urges the doctrine of salvation as the cardinal truth of Christianity, and illustrates the relation of the Christian to the Jewish church. The second contains exhortations and benedictions. It was called forth by some agents of the Jewish Christian party who endeavored to overthrow the belief in salvation by grace, and to incorporate circumcision and other Jewish rites with the ordinances of Christian worship. There is much diversity of opinion as to when and where the epistle was written; the majority of exegetical writers at present appear to assume that it was written from Ephesus, about the year 56. Special commentaries on this epistle have been written by Winer (4th ed., 1859), Flatt (1828), Usteri (1833), Rückert (1833), Hilgenfeld (1852), and Wieseler (1859). See also Holsten, *Inhalt und Gedankengang des Briefes an die Galater* (1859).

GALATZ, or *Galatz*, a town of Roumania, in Moldavia, on the left bank of the Danube, between the mouths of the Sereth and Pruth, 120 m. S. by E. of Jassy; pop. nearly 80,000, including many Greeks and Jews, some Armenians, and a vast multitude of foreign residents of almost all European nationalities. The old part of the town consists of filthy and narrow streets, but the new part contains good stone houses, and has a more pleasant

and an excellent quarantine building. Galatz is a free port, and one of the most important emporiums of the Danube. The opening of that river to all nations by the terms of the treaty of Paris of 1856 produced a great influx of merchants and traders, and the population, which had increased from 8,000 in 1835 to 50,000, growing chiefly during the Crimean war, rapidly rose to 70,000, but has of late increased more slowly, owing to the partial diversion of the trade by railways to other points. About half of the trade by sailing vessels is carried on under the Greek flag, though the English and Italian merchants have become great rivals of the Greeks. The Sulina mouth of the Danube forms the outer harbor for the accommodation of large ships, and the port of Galatz proper is accessible to craft of 800 tons. The exports of 1871 included nearly 400,000 quarters of wheat and about 500,000 of maize, besides flour and other cereals. Deal boards and timber are exported in great quantities, and tallow, wool, and hides to some extent. One third of the imports are from England, and the total value of imports (including those of Braila), chiefly manufactured and colonial goods and metals, is about £8,000,000. The average annual number of ships clearing for the Black sea is 1,150. Railways running respectively through Braila and Roman connect Galatz with Bucharest and Ozernewitz. The Russians took the town in May, 1789, and the Turks gained a victory here in August of the same year. Between 1848 and 1856 Galatz was on several occasions occupied by Turkish, Russian, and Austrian troops.

GALAXY (Gr. γάλα, milk; ὁ γαλαξίας κύβλος, the milky zone), the *vía lactea*, or milky way, an irregular band of light visible in the heavens on a clear night. The following is an abridgment of Sir John Herschel's account of this phenomenon. In the northern heavens the milky way is for the most part faint. From Cepheus over Cassiopeia, Perseus, Auriga, &c., to Monoceros, it forms a single stream, except where in Perseus it throws out a branch which can be traced as



Galatz.

appearance. The quay is used as the principal street, and there are extensive warehouses, granaries, and ship yards, and a large bazaar. The new Roman Catholic and several of the Greek churches are large edifices, and there are several educational institutions, a hospital,

far as ϵ Persei, and probably to the Pleiades and Hyades. Beyond Monoceros, southward, it becomes broader, brighter, and more complicated, opening out in Argo into a fan-like expansion 20° wide. Here the continuity of the stream is interrupted, a broad

black rift extending right across it in this part of its course. Beyond the rift is another fan-like expansion, whose widest part, like that of the other, abuts upon the rift. As the milky way narrows down toward the neck of this expansion, it becomes brighter, and its outline is in places singularly well marked. In Crux it expands again, but in the very heart of the expansion is a large black space perfectly clear of lucid stars and of milky light. This is the Southern Coalsack. Passing on toward Scorpio, we find the milky way dividing close by a Centauri into two branches, of which one only can be traced as a distinct branch for any distance. This stream passes northward over Sagittarius, where it exhibits a remarkably rich condensation, over Aquila, where are several such condensations, and thence, rapidly diminishing in brightness, to Cygnus. The other branch, as soon as it enters Scorpio, exhibits a multitude of complicated divisions, subdivisions, and detached portions. Near Antares it throws out a great projection toward Libra—that is, nearly at right angles to that of the main stream. Another subdivision, passing toward Serpens, seems to seek the main stream, but cannot be traced quite up to it, coming to an end a few degrees to the north of the star μ Sagittarii. Returning to the other stream near Cygnus, we find it proceeding to Cassiopeia, throwing out a projection from Cepheus toward the north pole, while from Cygnus a branch extends southward, very rich in Cygnus, but thence rapidly fading in brightness, until it comes to an end on the equator. In most maps this branch is carried southward beyond the equator to meet the branch which terminates near μ Sagittarii; but the two branches do not meet in reality. —The ancients held a variety of opinions concerning the milky way. Aristotle regarded it as constituted of the same substance as comets. Theophrastus looked upon it as the band along which the celestial hemispheres had been knit together, so carelessly that the fiery heavens beyond could be discerned. But Democritus formed the just opinion that the milky way consists of a multitude of stars. It was not until the invention of the telescope that its real nature could be demonstrated. Galileo, even with the small telescopic power at his disposal, was able to resolve the galaxy in many places into discrete stars. The labors of the Herschels, father and son, furnish the means of forming definite ideas respecting its constitution. In the first instance, Sir W. Herschel, regarding the milky way as of the same constitution as the star groups in our neighborhood, applied to it his famous method of star gauging. Where he counted most stars in the field of view of his telescope, he judged that the extension of the sidereal system was greatest, and thus he was led to the theory which has been called the “cloven grindstone” theory, according to which the sidereal system is greatly extended in the direction of the

milky way, and so forms a flat stratum, divided into two laminae opposite the part of the milky way which appears double. Herschel advanced this view in 1785; but the progress of his labors compelled him to abandon the theory that the milky way is constituted like the star regions in our neighborhood. Thus in 1802 he writes: “The stars we consider as insulated are also surrounded by a magnificent collection of innumerable stars, called the milky way, which must occasion a very powerful balance of opposite attractions, to hold the intermediate stars in a state of rest. For though our sun, and all the stars we see, may truly be said to be in the plane of the milky way, yet I am now convinced, by a long inspection and continued examination of it, that the milky way itself consists of stars very differently scattered from those immediately around us. On a very slight examination it will appear that this immense starry aggregation is by no means uniform. The stars of which it is composed are very unequally scattered, and show evident marks of clustering together into many separate allotments.” In 1811 he abandoned even more definitely the principle on which his system of star gauging had been based. “By continuing my sweeps of the heavens,” he says, “my opinion of the arrangement of the stars and their magnitudes, and of some other particulars, has undergone a gradual change. . . . An equal scattering of the stars may be admitted in certain calculations; but when we examine the milky way, or the closely compacted clusters of stars of which my catalogues have recorded so many instances, this supposed equality of scattering must be given up.” In 1817 Herschel adopted a new method of estimating the profundity of certain of the richer parts of the milky way. He regarded the dimensions of the telescope necessary to effect the complete resolution of such regions as affording a measure of the distance to which the milky way extended outward into space. It is not too much to say, however, that this method was as imperfect as that of star gauging, since it involved an assumption equally opposed to existing analogies. In star gauging Herschel assumed that there was a general equality of scattering; he now assumed a general equality of stellar lustre. If we consider his application of this principle to the great cluster in the sword hand of Perseus, we shall see that it was unsound. For from the gauging powers necessary to effect incipient resolution on the one hand and perfect resolution on the other (the latter not attained, but only a lower limit indicated), he inferred that the nearest part of this cluster is at about the 12th order of distance, the furthest certainly beyond the 844th order. But the cluster occupies but a minute space; it is indeed double, and the moon's disk would nearly hide both clusters at once. Is it credible, then, that we have here to deal with a long conical space having

a minute vertical angle, and the sun placed exactly at the vertex, while the remotest portion of the space thus occupied with stars is at least twenty-seven times further away than the nearest? Such a portion of space would have the shape of a long straight rod very delicate in its proportions. Apart from the antecedent improbability of such an arrangement, it is certain that a cluster of stars so shaped would have no dynamical stability. Moreover, the cluster in Perseus is not a solitary instance, since upward of thirty similar clusterings were counted by Herschel in the northern heavens alone, and Sir John Herschel observed many more in the southern portions of the milky way. These considerations seem to dispose of the principle on which Sir W. Herschel based this his latest method of star gauging. It seems demonstrated by the evidence that the stars seen in the clustering aggregations of the milky way are of many orders of real magnitude, and arranged at distances among which there is not even an approach to general uniformity. Sir John Herschel's observations of the milky way in the southern heavens go far to confirm these conclusions, though he himself adopted a theory in some sense resembling that which his father advanced in 1785; only that instead of regarding the galaxy as shaped like a cloven disk, he held that it resembles in figure a flat ring (cloven, necessarily, to explain the double portion of the milky way). The elder Struve was among the first to point out that the arrangement of the brighter stars over the heavens does not accord with either the cloven disk or the cloven ring theory of the galaxy. He found that the stars down to the eighth magnitude, which according to either theory should show no marked gathering toward the milky way zone, are nevertheless aggregated in the most striking manner upon that region. Hence Struve inferred that there is an aggregation of stars toward the medial plane of the milky way; and he adopted (quite unnecessarily, as it appears to the present writer) the theory that the range of stars constituting the milky way stratum is illimitable in all directions lying within that stratum. Struve's theory of an indefinite extension of the milky way in its own plane seems disposed of by the younger Herschel's observation that "throughout by far the largest portion of the extent of the milky way in both hemispheres, the general blackness of the ground of the heavens on which its stars are projected, and the absence of that innumerable multitude and excessive crowding of the smallest visible magnitudes, too small to affect the eye singly, which the contrary supposition would appear to necessitate, must, we think, be considered unequivocal indications that its dimensions, in directions where these conditions obtain, are not only not infinite, but that the space-penetrating power of our telescopes suffices fairly to pierce through and beyond it." Moreover, Sir John

Herschel disposed very completely of the reasoning on which Struve based the theory that light is gradually extinguished in its passage through space. "We are not at liberty," he said, "to argue that at one part of the milky way's circumference our view is limited by this sort of cosmical veil which extinguishes the smaller magnitudes, cuts off the nebulous light of distant masses, and closes our view in impenetrable darkness; while at another we are compelled, by the clearest evidence our telescopes can afford, to believe that star-strewn vistas lie open, exhausting their powers and stretching beyond their utmost reach, as is proved by that very phenomenon which the existence of such a veil would render impossible, viz., infinite increase of number and diminution of magnitude, terminating in complete irresolvable nebulosity." Recent researches have led to the inference that the structure of the galaxy is not so simple as any of the theories advanced by the Herschels or Struve would imply. The stars, even in one and the same portion of the galaxy, seem to present all those varieties of size and aggregation which have hitherto been ascribed to the effects of distance. It appears that often where the Herschels supposed that they were passing further and further, by means of their powerful telescopes, into the depths of space, they were in reality merely searching more and more scrutinizingly a particular region of our star system. The galaxy, according to these more modern views, would come to be regarded as an infinitely complicated spiral, with outlying branches extending beyond the range of the most powerful telescopes yet made. Moreover, it seems as if those mysterious objects the nebulae, instead of being distant galaxies as had been supposed (at least as respects the stellar nebulae), were in reality but portions of our own sidereal system. It is at least certain that the mysteries of the galaxy have not yet been fully solved, even if any noteworthy advance has been made toward their solution.

GALBA, Servius Sulpicius, a Roman emperor, born near Terracina, Dec. 24, 8 B. C., died Jan. 15, A. D. 69. As he inherited great wealth and possessed great talents, it was predicted both by Augustus and Tiberius that he would become the head of the Roman world. He attained the prætorship in A. D. 20, and the consulship in 38, carried on a war in Gaul in 39 against the Germans, was intrusted with the administration of Africa in 45, lived in retirement for several years under Nero, but in 61 was invested with the government of Hispania Tarraconensis. He was faithful to the emperor till in 68 Vindex rebelled in Gaul, and his own assassination was plotted by Nero. He then took the title of legate of the Roman senate and people, marched toward Rome, and on the death of Nero received the imperial dignity from the senate. He offended the prætorian guard by refusing the donative which had been promised in his name, and completed his ruin

by adopting Piso, a noble young Roman, for his successor. Otho, who had hoped for the adoption, formed a conspiracy among the soldiers, and Galba was murdered in the forum seven months after the beginning of his reign.

GALBANUM, a gum resin obtained from India and the Levant. The plant which produces it is not known with certainty, but it is probably a species of *ferula*, a genus of the order *umbellifera*. The drug is imported in massive lumps of irregular shape, apparently made up of agglutinated tears. They are brownish yellow, sometimes greenish, the tears sometimes translucent and bluish or pearl white. Its consistency in cold weather is that of wax; in warm weather it is soft and adhesive, and at 212° F. it can be strained, a process requisite to separate the stems and other impurities with which it is commonly mixed. When quite cold it is brittle and may be pulverized. The taste of galbanum is bitterish, hot, and aroid, and its odor balsamic, peculiar, and disagreeable. It is wholly soluble in dilute alcohol; less so in ether. Its specific gravity is 1.212; and its composition, by the analysis of Meissner, is as follows: resin, 65.8; gum, 22.6; bassorin, 1.8; volatile oil, 3.4; bitter matter with malic acid, 0.2; vegetal remains, 2.8; water, 2; loss, 1.4; total, 100. An essential oil is obtained by distillation, of a fine indigo blue, which it imparts to alcohol. Varieties of galbanum of somewhat different qualities are occasionally met with. Galbanum is rarely used medicinally as an internal remedy, though it possesses stimulant, expectorant, and antispasmodic properties, on account of which it is sometimes prescribed in catarrhs, chronic rheumatism, &c. Its most useful application is in the form of a plaster, alone or in combination with other substances, to produce a mild degree of counter-irritation. When given internally the dose is from 5 to 16 grs., which may be administered in the form of pills, or made into an emulsion with gum arabic, sugar, water, and the like.

GALE, James, an English inventor, born near Plymouth in July, 1833. Before reaching manhood he became totally blind. He was for a time a partner in a manufacturing house, and afterward practised as a medical electrician at Plymouth. In 1865 he announced that he had "discovered a means of rendering gunpowder non-explosive and explosive at will, the process for effecting the same being simple, effectual, and cheap, the quality and bulk of the gunpowder remaining uninjured." The invention consists in mixing powdered glass with the gunpowder, which renders it unexplosive, but which by a simple process can be separated from it again. Mr. Gale has also invented an ammunition slide gun, a fog shell, and a balloon shell. His biography, by John Plummer, was published in 1868, under the title, "The Story of a Blind Inventor."

GALE, Theophilus, an English theologian, born at King's Teignton, Devonshire, in 1628, died at Newington in March, 1678. He graduated at

Magdalen college, Oxford, in 1649, became a fellow and an active tutor in 1650, and afterward a popular preacher in Winchester. At the restoration he was ejected from his fellowship for nonconformity. In 1677 he became pastor of a congregation at Holborn, and afterward taught private pupils at Newington. At his decease he left his property to trustees for the education of dissenting students, and bequeathed his library to Harvard college. Besides his great work, "The Court of the Gentiles, or a Discourse touching the Original of Human Literature, both Philologic and Philosophic, from the Scriptures and Jewish Church," &c. (5 vols. 4to, 1669-'77), he published "The True Ideal of Jansenism" (1669), *Philosophia Generalis* (1676), sermons, &c.

GALE, William. See supplement.

GALEAZZO. See **SPORZA**, and **VISCOINTI**.

GALEN, Christoph Bernhard von, a German soldier and prelate, born at Bispinck, Westphalia, about 1600, died at Ahaus, Sept. 19, 1678. Early connected with the church, and having studied at the Jesuits' college and in various universities, he became prominent in the civil as well as in the ecclesiastical administration of Münster, and was promoted to be bishop of that see in 1650, after the death of the elector Ferdinand of Cologne. But he had no sooner restored the discipline and prosperity of his diocese, and caused the last remnants of the foreign invaders to leave, than he had to contend with the jealousy of the deacon Mallingkrott, and with the refractory citizens of Münster. On his threatening to put the place in a state of siege, they sent emissaries with whom he concluded an arrangement. But the feeling against him continued, and the representative of the city at the Hague declared that it would rather be ruled by the Turks, or even by the devil, than by the bishop. While the Netherlands loaned 25,000 florins to the insurgent city, the emperor Leopold I. threatened (1660) to put it under the ban of the empire, and sent troops for the restoration of obedience. Münster was obliged to surrender (March, 1661) to the bishop, who ruled thenceforward with an iron hand and remained undisturbed in his authority. In 1664 he was appointed by the diet of Ratisbon as inspector, together with the margrave Frederick of Baden, of the military organization of the Rhenish alliance, joined with the bulk of his army the war against the Turks, and gained a renown which encouraged him to retaliate upon the Dutch republic, by attacking it on land, while England was to engage in hostile naval operations. Through the mediation of Louis XIV. peace was made in April, 1666, and the bishop was restored to the possession of his whole diocese with the exception of the domain of Borkele. In 1672 hostilities were renewed by his joining France against the Netherlands, after having in the preceding year settled his differences with the Brunswick dynasty in regard to the abbey of Korvei, of which he had been appointed ad-

ministrator in 1662. The operations against the Netherlands opened auspiciously, but he was overwhelmingly defeated at Coevorden at the close of 1672; and the emperor of Germany having entered into a coalition with the elector of Brandenburg, the bishop hastened home to protect his own dominions. He succeeded, with Turenne, in occupying several Westphalian possessions of the elector, but, with an army considerably reduced in numbers by defeats, he was but too glad to accept terms of peace in 1674, pledging himself to restore to the Dutch all the places which he had taken from them. Ever ready to join a fray, the warrior-bishop sided in 1675 with the emperor against France, and in August of the same year he joined Denmark and Brandenburg in operations against Sweden. He personally conducted the operations against the duchies of Bremen and Verden, which then formed part of the latter kingdom, and in August, 1676, captured Stade, the capital of the duchy of Bremen; after which he divided the conquered territory with the dukes of Brunswick, receiving the whole of Bremen and other localities. He now increased his military forces in order to furnish to Spain, in 1677, a contingent of 9,000 men against France, and to Denmark one of 5,000 against Sweden, while part of his troops re-enforced the imperialists on the Rhine and the Moselle. But a portion of his soldiers having taken up winter quarters in East Friesland, complications arose in that region, again involving him in war; and he would have insisted upon a permanent occupation if the East Frieslanders had not induced him by considerable bribes to evacuate their soil in 1678. He participated in the negotiation of peace at Nimeguen.—Tücking has published *Geschichte des Stifts Münster unter Galen* (Münster, 1865).

GALEN (**GALENUS**), **Claudius**, an ancient physician, born in Pergamus in Mysia, A. D. 130, died, according to Suidas, in 200 or 201, but according to his Arabic and some other biographers, from 10 to 18 years later. Galen at 15 studied logic and philosophy; two years afterward he began the study of medicine; and at about the age of 20 he travelled into various countries to complete his education. He was absent from Pergamus nine years, and when he returned he was appointed city physician to the school of gladiators. Some popular commotions having arisen a few years after his appointment, he went to Rome, where he spent about four years, and acquired great reputation for skill in anatomy and medicine. As soon as the troubles in Pergamus had passed away, Galen hastened back; but hardly had he reached his destination when he was summoned by the emperors Marcus Aurelius and Verus to attend them at Aquileia where a pestilence raged in the camp. Verus died of apoplexy on the way to Rome, and Galen accompanied Marcus Aurelius thither. When returning to the camp after the apotheosis of his colleague, Marcus Aurelius urged Galen to ac-

company him, but he declined under pretence that *Æsculapius* had enjoined him to remain. How long he sojourned in Rome during his second visit is uncertain, but while there he continually added to his fame by his lectures, writings, and practice. He ultimately returned to his native city, and died there. Galen was not only the most eminent physician, but also one of the most learned and accomplished men of his age; and for more than 1,000 years after his death his authority in medical matters was regarded in Europe as almost supreme. He was a very voluminous writer on medical and philosophical subjects. There are still extant 88 treatises of his, and 15 of his commentaries on various works of Hippocrates, besides fragments of his lost works and writings falsely attributed to him. The best edition of his works is that by Kühn (20 vols. 8vo, Leipsic, 1821-'38). Writings attributed to him were discovered and published in Paris by Minas in 1844, and by Daremberg in 1848.

GALENA, sulphuret of lead, the ore which furnishes most of the lead of commerce. It occurs in highly crystalline masses, which separate into cubical fragments. Its structure is also granular, and sometimes fibrous. Freshly fractured, it presents a brilliant lustre like polished steel, which changes by exposure to a dull lead-gray color. Its hardness is from 2.5 to 2.75; specific gravity, 7.25 to 7.7. Its composition, represented by the symbol PbS, is lead 86.6, sulphur 13.4; but it often contains other metals, as antimony, silver, zinc, iron, and copper, as well as the substance selenium. It is also largely intermixed with the earthy gangues that form the principal portion of the veins in which it is found. From these, and from the sulphurets of zinc and the pyritous copper and iron usually associated with the ore, it is separated as far as practicable before smelting by the processes of stamping or crushing, jigging, &c. (See **LEAD**, and **METALLURGY**.) In some veins and beds it is frequently found in large groups of cubical crystals, which are very free from foreign substances. In this form it is met with in the fissures in the limestone of the lead region of Wisconsin, Iowa, and Illinois, imbedded in the clay with which the fissures are filled. Galena is a valuable ore for the silver it often contains, as well as for the lead. In reducing the ore by smelting, the silver all goes with the lead, which is run out; and from this it is separated either by the process of cupellation, or parting by crystallization, or other method. The lead ores however do not all contain silver enough to render its extraction profitable, although the separation is so cheaply conducted that 8 oz. of silver to the ton of lead will pay for the operation. Galena rich in silver is a product of numerous veins in the granitic and metamorphic rocks of New England and the Pacific states; but the more argentiferous it is, the less certain is the yield of the veins in quantity, and few of this character have been found

profitable to work. In Cornwall and Devonshire, England, mines of argentiferous galena have been worked profitably for centuries, even when a product of 9 or 10 oz. of silver to the ton of silver-lead was required to pay the expense of separation. The richest metal was from the ores of mines near Beer Alston in Devonshire, which yielded from 80 to 120 oz. of silver to the ton of lead; one portion of the mines, known as the South Hooe, yielded lead containing 140 oz. of silver to the ton. These mines, though now of little importance, were famous for their production in the time of Edward I. and II. The most celebrated mines of argentiferous galena in the United States are those of the Washoe district, Nevada. Galena may be formed artificially by fusing lead with sulphur.

GALENA, a city, port of delivery, and the county seat of Jo Daviess co., Illinois, and the centre of the region known as the "Galena lead mines," situated on both sides of the Galena river, 6 m. from its mouth in the Mississippi, and on the N. division of the Illinois Central railroad, 14 m. S. E. of Dubuque, Iowa; pop. in 1850, 6,004; in 1860, 8,196; in 1870, 7,019, of whom 2,478 were foreigners. Galena river is generally navigable for any steamboats that can ascend the rapids of the Mississippi. The ground upon which the city is built rises abruptly at a short distance from the river on both sides, and some of the bluffs reach a height of upward of 200 ft. These bluffs, which encircle the whole city, are composed of mountain limestone, and give the place an extremely irregular and picturesque appearance. The streets rise one above another, and communicate with each other by steps. The public and private buildings are mostly of brick, and many of them in a good style of architecture. On the W. side of the river are a fine high school building, the United States marine hospital (now used by the normal school), and the government building, accommodating the custom house and post office. In the environs are many streams of water, which afford ample power for manufacturing purposes. The city contains an iron foundry, two manufactories of furniture, a woollen mill, two flour mills, a saw mill, two planing mills, and a sash and blind factory. There are two national banks, with a capital of \$325,000. For the year ending June 30, 1878, the number of vessels belonging to the port was 60, with an aggregate tonnage of 7,782, of which 25 of 3,768 tons were steamers, and 85 of 4,019 tons barges. The shipments in 1872 were 800,000 bushels of oats, 75,000 pigs of lead, 4,000 tons of zinc ore, 75,000 barrels of flour, 46,000 of pork and lard, 42,000 dressed hogs, and 250,000 lbs. of meat in bulk; receipts, 7,000,000 feet of lumber. The Northwestern German-English normal school in 1872 had 6 instructors and 62 students. The number of public schools was 16, having 19 teachers and 893 pupils. There are one daily, one tri-weekly, and three weekly

(one German) newspapers, and 12 churches.—Galena was laid out in 1827, and incorporated as a city in 1839, deriving its name from the sulphuret of lead so called, which abounds in the locality. (See **LEAD**.)

GALEOPTHECUS. See **FLYING LEMUR**.

GALEIUS, *Gaius Valerius Maximianus*, a Roman emperor, reigned from A. D. 305 to 311. A native of Dacia and the son of a peasant, he distinguished himself in the armies by his courage, and was appointed Cæsar in 292 by Diocletian, whose daughter he married. Receiving Thrace and Macedonia for his province, he was defeated by the Persian king Narses, but was so disdainfully received by the emperor at Antioch on his return that he again set out, crossed the Euphrates, and gained a decisive victory over the Persian king. He now extorted from Diocletian an edict of proscription against Christianity, which was bloodily executed. After the abdication of Diocletian in 305 he reigned over the East; but when Italy recognized the authority of the usurper Maxentius, he marched thither to besiege Rome, which he had never yet seen, but was defeated by Maxentius (307). The rest of his life was devoted to the draining of lakes and the clearing of forests.

GALES. **I. Joseph**, an American journalist, born in England about 1760, died in Raleigh, N. C., Aug. 24, 1841. He was originally a printer and bookseller at Sheffield, where he founded and published the "Sheffield Register." His republican principles involved him in difficulty with the government, and in 1798 he sold his journal to James Montgomery the poet, and emigrated to the United States. He settled in Philadelphia, where he conducted the "Independent Gazetteer" for two or three years, and introduced the practice of reporting by shorthand the debates in congress. In 1799 he sold the paper to Samuel Harrison Smith and removed to Raleigh, N. C., where he established the "Register," which he conducted for nearly 40 years. **II. Joseph**, son of the preceding, born at Eckington, near Sheffield, April 10, 1786, died in Washington, D. C., July 21, 1860. He was educated at the university of North Carolina, went to Philadelphia to learn the art of printing, and in 1807 settled at Washington as the assistant and afterward as the partner of Samuel Harrison Smith, who in 1800 had removed the "Independent Gazetteer" to Washington and changed its name to the "National Intelligencer." In 1810 Mr. Gales became sole proprietor of the journal, which was published tri-weekly. In 1812 he took into partnership his brother-in-law, Mr. William W. Seaton, and in January, 1813, began to issue the "National Intelligencer" daily. It was continued till 1869.

GALESBURG, a city and the county seat of Knox co., Illinois, on the Chicago, Burlington, and Quincy railroad, at the junction of the Burlington and Peoria branches, 160 m. W. S. W. of Chicago and 40 m. E. by N. of Burlington,

Iowa; pop. in 1860, 4,958; in 1870, 10,158, of whom 8,186 were foreigners. It is surrounded by a rich farming region, and has an active trade. The machine shops and stock yards of the railroad company are situated here, and the city also contains three large foundries, a manufactory of agricultural implements, and two hotels. It is noted as the seat of Lombard university (Universalist), organized in 1857, which in 1871-'2 had 11 professors and instructors, 165 students (82 collegiate), and a library of 8,300 volumes; and of Knox college (Congregational), organized in 1841, which had 15 professors and instructors, 329 students (68 collegiate), and a library of 6,200 volumes. Both institutions admit females. There were 27 public schools in 1872, including a high school, having 56 teachers and 2,821 pupils. The city library contains 6,500 volumes, and that of the young men's library association 4,000 volumes. There are three national banks, with \$850,000 capital, a daily, a semi-weekly, and two weekly newspapers, a monthly periodical (Swedish), and 15 churches, of which three are Swedish, one German, and two colored.

GALESVILLE, a town and the capital of Trempealeau co., Wisconsin, situated on Beaver creek, about 6 m. from the Mississippi, and 120 m. N. W. of Madison; pop. in 1870, 1,068. It is the seat of Galesville university (Methodist), organized in 1855, which in 1872-'8 had 5 professors, 145 students (35 collegiate and 110 preparatory), and a library of 4,500 volumes. The town was laid out in 1854 by the Hon. George Gale, who gave a considerable sum for the endowment of the university.

GALICIA (Ger. *Galizien*, Pol. *Galicya*), a crownland or province of the Cisleithan division of the Austro-Hungarian empire, now comprising the kingdom of Galicia and Lodomeria, the duchy of Auschwitz (Oswiecim) and Zator, and the grand duchy of Cracow. It lies between lat. 47° 40' and 50° 50' N., and lon. 18° 54' and 26° 35' E., and is bounded N. by Russian Poland, from which it is in part separated by the Vistula, E. by Russia, S. by Bukowina and Hungary, being separated from the latter by the Carpathian ridge, and W. by Austrian and Prussian Silesia; area, 80,809 sq. m.; pop. in December, 1872 (estimated), 5,629,861. Its S. part is occupied by the N. branches of the Carpathians, which in some parts rise to a height of 6,000 ft., and in some peaks above 8,000. The central region is hilly; the northern belongs to the great Polish plain. From the Carpathians and their offshoots descend all the rivers which cross the country, flowing mostly in a N. and partly in a S. E. direction. Those flowing N., the Biala, Sola, Skawa, Raba, Dunajec, Wisloka, San (which divides the country into two unequal parts), and the Bug, are tributaries of the Vistula; the Pruth and the Dniester flow S. E., the former to the Danube, the latter, with its affluents the Stry, Sered, and Podhorze, to the Black sea. There are some marshes in the N. E. part of the plain,

and numerous mountain lakes, called "eyes of the sea," in the Carpathians, some at heights of 8,000 to 4,000 ft. The climate is healthy but cold, the country being exposed to the winds from the east and north, and closed against those from the south; the winters are long. The soil is varied, only the lower region, where loam and sand prevail, being productive, and in some places fertile; the mountains are rocky and sterile, or wooded. Tobacco and all the common grains, fruits, and vegetables are raised. There are few vineyards, and these yield no wine. The pine prevails in the forests, but the oak and beech also grow to an imposing size. Honey and wax, potash and tar, are made in large quantities. The rivers are rich in various kinds of fish. The chief mineral productions are iron, which is found along the whole line of the Carpathians; salt, mostly from the celebrated rock salt mines of Wieliczka and Bochnia in the vicinity of Cracow, and partly from saline springs in the eastern parts of the country; sulphur, produced chiefly at Swosowice; coal, in the territory of Cracow; and naphtha. Lead, copper, zinc, silver, and gold are also found. The inhabitants belong mostly to two Slavic tribes, the Poles and the Ruthenians, the former predominating in western (86 to 4 per cent.), the latter in eastern Galicia (87 to 20 per cent.), the remainder being Germans and Jews. In the whole country the Poles are about 43 and the Ruthenians 45 per cent. The nobility are mostly of Polish descent, vivacious, warlike, and ardently attached to their nationality; the peasants are hardy, rude, sluggish, and slavish; the Jews, who are very numerous in the cities, of which they often form half the population, are distinguished by a peculiar half oriental dress, and an unpleasant German jargon. Education, agriculture, and industry are backward; wealth is rare; excessive misery, especially among the Jews and mountaineers, is frequent. Distilleries abound in the villages, and stores and trading shops in the town quarters of the Jews, who before the revolution of 1848 were excluded by the government from both cities proper and villages. Manufactures are making considerable progress; the chief articles produced are linen, woollens, paper, wooden utensils, tobacco, leather, imitation jewelry, sugar, potters' ware, and glass. Commerce is limited and carried on mostly by Jews, the chief commercial cities being Cracow, Brody, and Lemberg, the capital. The chief exports are cattle and horses, grain, salt, timber, potash, skins and hides, and wool. Brody is an emporium for the transit trade with Russia. The Roman Catholics, about 2,600,000, have bishops at Przemyśl, Tarnow, and Cracow, and an archbishop at Lemberg; the members of the Greek united church, about 2,850,000, mostly Ruthenians, have an archbishop at Lemberg and a bishop at Przemyśl; the non-united Greeks, about 1,400, mostly Moldavians, belong to the bishopric of Czernowitz in Bukowina; the

united Armenians, 2,100, have an archbishop at Lemberg; the Protestants (34,000 Lutherans, 5,800 Reformed) have a superintendent in the same city; the Jews, about 580,000, have no hierarchical centralization. Only 80 per cent. of the children of school age attend any school. There are two universities, at Lemberg and Cracow. The Polish students (554 in Lemberg and 682 in Cracow) number nearly three times as many as the Ruthenian (480 in Lemberg and 14 in Cracow). The number of literary productions has of late largely increased, and the Ruthenians are making great efforts to dislodge the Polish as the literary language in their districts, but as yet with very little success. (See POLAND, LANGUAGE AND LITERATURE OF, and RUTHENIANS.) At the head of the administration is a stadtholder or governor, to whom are subordinate the political magistracies of Lemberg and Cracow and 74 *Bezirkshauptmannschaften*. There are supreme courts of justice at Lemberg and Cracow. The diet consists of the provincial marshal, the 8 archbishops and the 8 Catholic bishops (the see of Cracow has long been vacant), the rectors of the universities of Lemberg and Cracow, 44 deputies of large landed estates, 4 of the capital, 3 of the chambers of commerce and industry (Lemberg, Cracow, and Brody), 16 of the towns and industrial places, and 74 of the rural communities. Galicia is the only large division of the empire which has no regular fortress; transportation of troops, however, is facilitated by good roads, as well as by extensive railway lines, which connect Cracow and Lemberg with each other and with all the principal cities of the empire.—The earliest regular settlement of Galicia was by the Ruthenians (Pol. *Rusini*), who now occupy the eastern division, also called Red Russia. This was occupied toward the end of the 9th century by the Magyars, then passing to Hungary. Lodomeria, E. of modern Galicia, and then connected with it, was subdued by the Russians at the beginning of the 11th century. Various principalities, the chief of which was Halicz (from which the present name of the country is derived), were subsequently formed under the protection of the kings of Hungary. About the middle of the 13th century Galicia was annexed to Lithuania, in the early part of the 14th to Moscow, and after the death of the last prince of Halicz (1340) to Poland under the reign of Casimir the Great. From that time it shared the destinies of the latter country, down to the time of the first partition of Poland in 1772, when it was taken by the empress Maria Theresa, on the ground of the old claims of the crown of Hungary. It received the title of kingdom of Galicia and Lodomeria, though Lodomeria was in the possession of Russia. Bukowina was in 1777 united with it, and remained so until made a separate crownland in 1849. The last division of Poland (1795) brought new fragments of that country into the possession of the Hapsburgs, and the

province was divided into E. and W. Galicia. A part was ceded in 1809 to the duchy of Warsaw, and was afterward annexed to Russian Poland; another part was converted by the treaty of Vienna into the republic of Cracow (1815), and was annexed to Austria after the Polish rising of February, 1846, which was suppressed in Galicia through a frightful slaughter of the nobility by the peasantry. Insignificant attempts at insurrection were made in the spring of 1848 at Cracow and Lemberg. The constitutional régime which began in that year was short-lived; several conspiracies, aiming at the restoration of Polish independence, were detected and severely punished. A return to a liberal policy took place in 1860, and Galicia received its representation in the Vienna Reichsrath under the constitution of 1861, and again under that of 1867. In this body, however, the Polish representatives generally sided with the Czechs and other federalists, in opposition to the German majority, which aimed at preserving the unity of Cisleithan Austria. Various attempts to conciliate them by special concessions proved futile, and the Reichsrath finally baffled this opposition by the electoral reform law of 1873, which substituted direct elections to the Vienna assembly by districts for elections by the provincial diets. This at once divided the Galician representation, as in the elections toward the close of that year the Ruthenians carried a number of districts in direct hostility to the Polish national interest. The policy of abstention, in which the Poles formerly followed the Czechs, was abandoned. (For further historical details, see AUSTRIA, CRACOW, and POLAND.)

GALICIA, an old province, now a captaincy general, of N. W. Spain, comprising the modern provinces of Corunna, Lugo, Orense, and Pontevedra, bounded N. and W. by the Atlantic, S. by Portugal, and E. by Asturias and Leon; area, 11,344 sq. m.; pop. about 2,000,000. It is intersected by numerous narrow valleys, and is mostly mountainous, as the western continuation of the Cantabrian range spreads over the greatest part of the province, and watered by numerous torrents, streams, and rivers. The most remarkable of the latter are the Miso or Minho, with its affluents the Sil and the Tea, the Ulla, and the Tambre, which all become navigable in their lower course and empty into the Atlantic, forming there wide estuaries, or *rias*, and safe harbors. The coast, being rugged and more broken than those of Asturias and Biscay, owing to the violent currents of the Atlantic in these latitudes, presents many deep inlets and lofty promontories. Among its excellent harbors are those of Ferrol, said to be the best in Europe, and Vigo, the principal port on the W. coast, which is connected by rail with Corunna. The climate is cold in the interior and the more elevated regions, temperate in the lower country and along the coast. The proportion of arable land is very limited. The soil produces flax, maize, barley, wheat,

and an abundance of fruits, which constitute the main food of the population; the best oranges and wine are found in the S. part. Fishing and navigation form a principal part of the industry of the people, who also manufacture linen for domestic use. The inhabitants, called Gallegos, are hardy and robust, and speak a dialect greatly differing from the common Spanish. About 100,000 of them yearly leave their country, supplying the larger cities of Spain and Portugal with porters and servants, and the neighboring provinces with hands for the harvest, their wives performing the work in the house and the labor in the field during their absence. The chief towns are Corunna, the capital, Ferrol, Pontevedra, Vigo, Lugo, Santiago de Compostela (the ancient capital), and Orense.—Galicia was in antiquity the country of the Artabri and a section of Gallacia. After the invasion of Spain by the barbarians, in the commencement of the 5th century, it was successively conquered by the Suevi, Visigoths, and Saracens. Ferdinand I. of Castile, about the middle of the 11th century, erected it into a kingdom for one of his sons, who was soon deprived of his throne and estates by his brother Alfonso, king of Castile. Galicia was subsequently often held by the younger sons of the kings of Castile as an apanage, became independent in the course of time, and was finally annexed to his dominions by Ferdinand the Catholic.

GALILEE, the northernmost of the three western main divisions of Palestine in the time of the Romans, subdivided into Upper and Lower Galilee. Upper Galilee was bounded N. and W. by Mt. Lebanon, Cœle-Syria, and Phœnicia, E. by the Jordan, and S. by Lower Galilee. This division was called Galilee of the nations, or of the gentiles, because of the mixed nature of its population. It embraced the ancient territory of Naphtali, and the northern part of Asher. Lower Galilee was bounded N. by Upper Galilee, W. by Phœnicia and the Mediterranean, E. by the lake of Tiberias or Gennesaret, and S. by Samaria. This division contained the ancient territory of Zebulon and parts of Issachar and Asher. The inhabitants of Galilee spoke a rude, corrupt dialect, different from that of the Jews in Samaria and Judea, and were noted for their turbulent and rebellious spirit. It contained most of the places noted in the history of Christ, such as Nazareth, Cana, and Capernaum. The apostles were all Galileans by birth or residence. The chief city of Upper Galilee was Cæsarea Philippi; of Lower Galilee, Tiberias, which after the destruction of Jerusalem by the Romans became the principal religious centre of the Jews in northern Palestine.

GALILEE, Sea of. See GENNESARET.

GALILEO GALILEI (Galileo, by which he is commonly known, being his Christian name), an Italian philosopher and mathematician, born in Pisa, Feb. 15, 1564, died in Arcetri, Jan. 8, 1642. He came of a noble Florentine family,

whose original name was Bonajuti, which they exchanged for that of Galilei about the middle of the 14th century. Vincenzo, the father of the philosopher, was a man of learning and the author of a number of treatises on music. He was unable to give his sons a thorough education, but Galileo acquired, amid various discouragements, a fair knowledge of the classics and the common branches of learning, and also of music, drawing, and painting. The last named art he seems to have resolved upon cultivating as a profession, but his father sent him to Pisa to study medicine, where he was matriculated at the university as a scholar in arts, Nov. 5, 1581, and became a pupil of the celebrated botanist Cæsalpinus. He still employed his leisure in his favorite branches of the fine arts, and his love of drawing led him to study geometry. After many fruitless remonstrances his father left him to the natural bent of his genius. His first discovery was about 1583, when he was led to infer the isochronism of the vibration of the pendulum by noticing the regular swinging of a lamp in the cathedral of Pisa. Though it was 50 years before the philosopher applied his discovery to clockwork, he at once perceived its importance, and caused it to be employed by physicians in counting the pulses of their patients. Some time afterward, having read the treatise of Archimedes on floating bodies, he invented a hydrostatic balance, and wrote a description of it, which introduced him to the friendship of Guido Ubaldi, the mechanist and mathematician. A paper on the centre of gravity was indirectly the means of securing for him at the age of 25 a professorship of mathematics in the university of Pisa. The salary was but 60 crowns, and he had to look for his support partly to private pupils. His sarcastic attacks upon the notions of the Aristotelians, although his arguments were fortified with careful experiments, raised up a host of enemies, whose animosity pursued him for the rest of his life. He demonstrated the error of supposing that the velocity of falling bodies is proportional to their weight, by letting fall unequal weights at the same time from the top of the leaning tower of Pisa, explaining that the trifling difference of time noticed in their respective descents was owing solely to the resistance of the air. The death of his father in 1591 imposed upon him the duty of supporting the family. Soon after this the interest of Ubaldi procured him the appointment of professor of mathematics for six years in the university of Padua. This new position, upon which he entered in September, 1592, gave him a salary of 180 florins, and enabled him to remove from a city where the hostility of the Aristotelians embittered his existence. He constructed several useful machines for the state, and composed treatises on gnomonics, astronomy, mechanics, architecture, and even fortification, which he delivered in the form of lectures. In 1597 he made a kind of thermometer in which both air

and water were employed. During this period he began a friendly correspondence with Kepler, which continued until the death of the latter; and about the same time appeared a treatise on the sphere after the Ptolemaic system, which has been attributed to Galileo on rather insufficient grounds. It was published from a MS. in the library of Somaschi at Venice (Rome, 1656). Probably between the years 1593 and 1597 Galileo became a convert to the Copernican theory of the revolution of the earth about the sun; but it is impossible to fix the date of this important event in his life, for he says in a letter to Kepler (1597), that in deference to public opinion he did not declare his conviction of the truth of the new doctrines for some years after he had formed it. On the expiration of the term of his professorship the Venetian senate appointed him for six years more, and raised his salary to 320 florins. In 1604, a new star of remarkable brilliancy having appeared in the constellation Serpentarius, he attacked the popular notion that it was a meteor, and proved by the absence of parallax that it was far beyond the limits of our system. His appointment at the university was again renewed, with an addition of 200 florins to his salary. The crowds that came to hear him were now so great that he was sometimes obliged to lecture in the open air. In 1609 a report reached him at Venice that a Dutchman had constructed an instrument which had the property of making distant objects seem near. On his return to Padua the philosopher immediately applied himself to the solution of the mystery, and, after trying several combinations of lenses, succeeded in making an instrument which magnified three times. It consisted merely of a leaden organ pipe, with a plano-convex glass at one end and a plano-concave at the other. This he carried to Venice, where it at once became an object of the intensest public curiosity. He presented it to the senate, who thereupon confirmed him in his professorship for life, and raised his salary to 1,000 florins. Galileo soon constructed another telescope which magnified eight times, and at length a third which had a power of 30. The wonders of the heavens now unfolded to him, which no man had ever seen before, filled him with "incredible delight." His earliest observations were upon the moon, whose inequalities of surface he was the first to trace. He saw myriads of stars in the milky way, counted 40 in the Pleiades, and at length, on Jan. 13, 1610, after six nights' observation, discovered the revolution of four satellites around the planet Jupiter. He did not publish this intelligence until by repeated examination, up to March 22, he had insured himself against the danger of mistake. The account of his discoveries, which he entitled *Sidereus Nuncius*, the "Sidereal Messenger," was received by the astronomers of the old school with insults and incredulity. Some exclaimed against the impiety of scooping out valleys from the fair face

of the moon; some attempted to explain away the satellites of Jupiter as mere appearances caused by reflected light. A professor in the university of Padua argued that as there were only seven metals, seven days in the week, and seven apertures in a man's head, so there could be but seven planets; and when forced to admit the visibility of the satellites through the telescope, he reasoned that, being invisible to the naked eye, they were useless, and consequently did not exist. Several persons claimed a prior discovery of the "Jovian planets," and the astronomer Zach, as late as 1788, claimed for Thomas Harriot the credit of having observed them on Jan. 16, 1610, some time before Galileo's discovery was made known. According to Sir David Brewster, however, Harriot did not see them till Oct. 17. Viviani, in his life of Galileo, tells us that the telescope led him to the construction of the compound microscope, and that he presented one to the king of Poland. The grand duke of Tuscany gave Galileo 1,000 florins, and made him his philosopher and mathematician with a liberal salary and nominal duties. He now removed to Florence. To guard against future attempts to steal his laurels, he published his subsequent discoveries in enigmas, and thus in the course of the same year he announced that Saturn was "triple," an appearance which Huygens subsequently showed was caused by that planet's rings. Galileo was the first to notice that Venus exhibits phases like those of the moon; and if not the first to descry spots on the sun's disk, he was at least the first to note their peculiarities, and to infer from them the sun's rotation. Some of these observations were made in 1611 at Rome, which he then visited for the first time, where he erected his telescope in the Quirinal garden belonging to Cardinal Bandini. He was received with the highest honors, and became a member of the famous Lincean academy. In 1612 he combated in his work on the laws of floating bodies the common opinion that the tendency of substances to sink or swim in water depends on their shape. With this period in his life the philosopher may be said to have reached the zenith of his prosperity, while at the same time the malice of his enemies began to acquire a dangerous intensity. The Copernican system, which he had long taught in public, afforded a good pretext for attacking him. The sun's revolution round the earth was thought to be a truth of Scripture. Certain Tuscan ecclesiastics began to preach against the wickedness of sending our world spinning through space, and a sarcastic Dominican hurled a sermon at Galileo from the text: *Viri Galilei, quid statis adspicientes in calum?* "Ye men of Galilee, why stand ye looking up into heaven?" In 1613 Galileo addressed a letter to his pupil Castelli, showing that the language of the Bible should be interpreted according to popular ideas, and that the Ptolemaic system is really as much at variance with it as the Copernican.

This was followed by one to Christina, grand duchess dowager of Tuscany, reiterating his views, and supporting them by quotations from the writings of the fathers. A Dominican, Lorini, laid a copy of the Castelli letter before the Roman inquisition in February, 1616, but the inquisitors refused to act in the matter, remarking that by confining himself to the system and its demonstration, and letting alone the Scriptures, Galileo would be secure from molestation. His enemies, however, continued their intrigues, and about the end of 1615 he went to Rome, either to obtain a formal sanction of his opinions, or in obedience to a summons. His case came again before the holy office in February, 1616. He was charged with teaching that the sun is the centre of the planetary system, and interpreting Scripture to suit his own theory. The qualifiers of the inquisition pronounced the obnoxious doctrines "formally heretical, because expressly contrary to Holy Scriptures." Galileo's letters to Castelli and the grand duchess, Copernicus's work on the revolution of the heavenly bodies, and Kepler's epitome of the Copernican theory, were placed on the *Index Expurgatorius*, whence they were not removed until the time of Benedict XIV.; and Galileo himself was forbidden ever again to teach the motion of the earth and the stability of the sun. Thenceforward he was not permitted to express himself as though Copernicanism were, in the words of the Roman *curia*, "an actually grounded hypothesis." But he was permitted and encouraged to use the hypothesis most actively as his clue to fresh scientific results, and to treat with the most ample justice the scientific arguments for and against. He was permitted to maintain that Copernicanism was scientifically likely in the highest possible degree; but he was not at liberty to teach expressly that it had received absolute and irrefragable proof. He had an audience of the pope, however, who assured him of his protection, and in 1617 he returned to Florence. Sickness prevented him from observing the three comets which appeared in 1618, but he entered warmly into discussions about them, and is supposed to have had the chief share in a lecture delivered by his friend Guiducci and printed in 1619, in which they are held to be only meteors. This discourse was attacked by the Jesuit Grassi under the pseudonym of Lotario Sarsi, and defended by Galileo in his *Saggiatore* ("Assayer"), one of the most beautifully written of his works. On the accession of his friend Cardinal Barberini to the pontificate under the title of Urban VIII., he went to Rome to offer his congratulations, arriving in the spring of 1624, and receiving during the two months that he remained every mark of esteem and liberality. The pope granted him a pension of 100 crowns, and one of 60 crowns to his son. He now set about composing a work in which he might sum up all the arguments for and against his favorite theory. It was written in the form

of dialogues, and accompanied by a preface in which he protested ironically against the idea that the decision of the inquisition in 1616 was rendered through ignorance or passion. He says that, on the contrary, its officers listened with attention to his statement of the scientific arguments on which his theory was based, and maintains that the grounds upon which their decision was justified were entirely religious. The book was published at Florence in 1632 under the title of "Dialogue on the two Principal Systems of the World, the Ptolemaic and Copernican." This being regarded as a violation of the injunction, Galileo was ordered to appear in person at Rome, where he arrived in February, 1638, and took up his quarters with the Tuscan ambassador. His trial was short. The principal ground of complaint was the disobedience of the command of 1616, and the scientific reasons which Galileo again urged in support of his theory were not appreciated any better than before, but were met with religious arguments. The sentence was solemnly pronounced June 22. It set forth the offence of the accused in teaching a condemned proposition, violating his pledge, and obtaining a sanction for his book by improper means, declared him to be vehemently suspected of heresy, required him to abjure his errors and all other heresies against the Catholic church, prohibited his "Dialogue," and condemned him to be imprisoned at the inquisition during pleasure, and to recite once a week for three years the seven penitential psalms. Galileo made his abjuration with all the formality which commonly attended such proceedings. Clad in sackcloth and kneeling, he swore upon the Gospels never again to teach the earth's motion and the sun's stability; he declared his detestation of the proscribed opinions, and promised to perform the penance laid upon him. Then rising from the ground, he is said to have exclaimed in an under tone: *E pur si muove*—"It does move, for all that!" After four days' confinement under the eyes of the holy office, Galileo returned to the Tuscan ambassador's, but for the rest of his life he was kept under surveillance. He passed some time in Siena, in the archbishop's palace, and in December reentered his own house at Arcetri, near Florence, where he remained until the close of his life. The death of his favorite daughter Maria so affected his already broken health that he begged permission to visit Florence for medical assistance. It was only after four years (1688) that he obtained it, and then under severe restrictions. He seems now to have paid little attention to astronomy, but employed himself in other branches of natural philosophy. In 1688 his book of "Dialogues on Local Motion," completed two years before, which he prized above all his other works, was printed at Amsterdam by Louis Elzevir. In 1686 also he discovered the moon's diurnal libration. In 1687 a disease which had impaired his right eye for some years attacked the left also, and in a few months

he became totally blind. The severity of the inquisition was somewhat relaxed in his affliction; he was visited by eminent men of his own and foreign countries, among whom were Milton, Gassendi, and Diodati, and in the last years of his life his pupils Viviani and Torricelli formed part of his household. Almost complete deafness afterward came upon him, and at last, while preparing for a continuation of his "Dialogues on Motion," he died of fever and palpitation of the heart.—Galileo was of middle size, well formed, with fair complexion and penetrating eyes. He was cheerful, frank, and amiable; frugal and abstemious, but fond of gay company and good wine, and profuse in his hospitality. He was unmarried, but left three natural children. His temper was quick, but placable, and his general accomplishments made him a favorite in mixed circles. His scientific writings were marked by a clear, elegant, and spirited style, which he owed to a careful study of the literature of his country. He was a great admirer of Ariosto, whose *Orlando furioso*, it is said, he knew by heart, and wrote severe "Considerations on Tasso" (Venice, 1793), to show that author's imitation of his favorite poet.—The following is a list of his principal works which were printed separately: *Operazioni del compasso geometrico e militare* (Venice, 1606); *Difesa contra alle calunnie ed imposture di Balt. Capra nella considerazione astronomica sopra la nuova stella del 1604* (1607); *Sidereus Nuncius* (Florence, Venice, and Frankfort, 1610); *Discorso intorno alle cose che stanno in su l'acqua e che in quella si muovono* (Florence, 1612); *Epistola ad M. Velsorum de Maculis Solaribus* (1612); *De Maculis Solaribus et Stellis circa Jovem errantibus accuratior Disquisitio* (Angsburg, 1612); *Istoria e dimostrazioni intorno alle macchie solari e loro accidenti* (Rome, 1613); *Dissertatio de Cometa Anni 1619* (Florence); *Il saggiatore* (Rome, 1623); *Dialogo sopra i due massimi sistemi del mondo, Tolemaico e Copernicano* (Florence, 1632; a Latin translation by Bernegger, entitled *Systema Cosmicum*, &c., Strasburg, 1635; an English version, "The Systeme of the World, in four Dialogues, Inglished from the Original Italian Copy by Thomas Salusbury," London, 1661); *Discorsi e dimostrazioni matematiche attenenti alla meccanica ed i movimenti locali* (Leyden, 1688; an English translation under the title "Mathematical Discourses of Mechanics," by Thomas Weston, London, 1730); *Epistola tres de Conciliatione Sacra Scriptura cum Systemate Telluris Mobilis* (printed with Gassendi's *Apologia*, Lyons, 1649). Collections of Galileo's works were published at Bologna by Manolesi (2 vols. 4to, 1656); Florence, by Bottari (3 vols. 4to, 1718); Padua (4 vols. 4to, 1744); Milan (18 vols. 8vo, 1808-'11). Eugenio Alberi edited a complete edition, with the life by Viviani (16 vols., Florence, 1842-'56).—For lives of Galileo see Viviani, *Vita del Galilei*, in the *Fatti consolari dell'accademia Fiorentina*; Frisi, *Elogio del*

Galileo (Leghorn, 1775); Brenna, in Fabroni's *Vita Italorum*; Nelli, *Vita e commercio letterario di Galileo Galilei* (2 vols. 4to, Lausanne, 1793); Lord Brougham's "Life of Galileo" (1829); Libri, *Histoire de la vie et des œuvres de Galileo Galilei* (Paris, 1841); Biot, in Michaud's *Biographie universelle*; Drinkwater-Bethune, "Life of Galileo," in the "Library of Useful Knowledge"; Sir David Brewster, in Lardner's "Cabinet Cyclopædia," reprinted with lives of Tycho Brahe and Kepler under the title "Martyrs of Science" (London, 1841). Among recent biographies are those of Philarrète Chasles (1862), Madden (1863), Trouessard (1856), Pauhappe (1868), and "The Private Life of Galileo" (London and Boston, 1870); also Botta's "Italian Philosophy," in vol. ii. of Ueberweg's "History of Philosophy," translated by George S. Morris (New York, 1874).

GALLINARD, Nicolas Auguste, a French painter, born in Paris, March 25, 1818. He studied under Ingres, and exhibited his first works in 1835. "The Ode," exhibited in 1846, was purchased for the gallery of the Luxembourg. The emperor Napoleon bought in 1857 his "Leda," to which the committee of the exhibition of 1855 had objected on account of its indecency. He has executed many paintings for churches, and particularly excels in cartoons for church windows. He has introduced among artists the use of paints with a base of zinc, and has written much on art and contemporary artists. One of his writings is entitled *L'Art des vitraux*.

GALIN, Pierre, a French musician, born in 1786, died in Paris about 1822. He studied and taught mathematics at Bordeaux, and the application of this science to music led him to the invention of a new method of teaching the latter art, mainly consisting in separating the study of tone from that of measure. He called his system *le mélodiste*, and explained it in his *Exposition d'une nouvelle méthode pour l'enseignement de la musique* (Bordeaux, 1818). He resided in Paris from 1819 to the time of his premature death, engaged in teaching and lecturing upon his method. This has been adopted to some extent in Europe and in the United States, under the name of that of Galin-Chevé-Pâris. His pupils Édouard Jue, Aimé Lemoine, M. de Geslin, and Aimé Pâris successively published works on the subject (1821-'85).

GALLITZIN. See GALLITZIN.

GALL, a saint of the Roman Catholic church, called the apostle of Switzerland, born in Bangor, Ireland, about 551, died in St. Gall, Oct. 16, 646. According to some biographers, his original name was Gallun or Gilian, while others call him Gall of Hibernia to distinguish him from another St. Gall, bishop of Clermont-Ferrand, who died about 550. He was of noble parentage, was educated under Columbanus in the monastery of Bangor, and followed him to Gaul. After sharing the dangers and vicissitudes of his master's life, he refused while sick of a fever to follow him into Italy. Co-

lumbanus punished the refusal by forbidding Gall to celebrate mass during the abbot's lifetime. No sooner had Gall recovered from his illness than he and his monks, who with one exception had remained with him, left their abode at Bregenz, and selected a site for a new monastery on the steep banks of the Steinaach, not far from the southern shore of Lake Constance. By his eloquence and his command of the German tongue he was able to spread the knowledge of Christianity rapidly among the Alemanni and Helvetii. Having cured miraculously, as it was thought, the daughter of a chief or duke of the former, Thierry II., to whose son she was affianced, bestowed on the missionary all the land he wished to occupy between Lake Constance and the Rhetian Alps (about 612). Constance being created an episcopal see, Gall was chosen as its bishop; but he excused himself on account of the injunction of Columbanus forbidding him to perform sacred functions. In 615 the latter from his deathbed sent his crozier as a token of forgiveness; and ten years later Gall was invited to assume the government of the great monastery of Luxeuil, but alleged his obligation of evangelizing the heathen tribes of southern Germany. The number of his disciples now increased wonderfully. Around the humble monastery his converts came to dwell, until the clustering huts grew in after years to be the city of St. Gall. At his death the territory occupied by the Alemanni was a Christian province. His feast is celebrated on Oct. 16. A discourse pronounced at the consecration of the bishops of Constance is the sole relic which has reached us of all his learning. The life of St. Gall was written in the 9th century by Walafried Strabo, and in Latin verse by the monk Notker in the 10th. See also the Bollandists' new *Acta Sanctorum* for Oct. 16, and Montalembert's *Moines d'Occident*.

GALL, Franz Joseph, the founder of phrenology, born at Tiefenbronn, near Pforzheim, in Baden, March 9, 1758, died at Montrouge, near Paris, Aug. 22, 1828. After literary studies at Baden and Bruchsal, he devoted himself especially to natural history and anatomy at Strasburg under Hermann, and passed thence in 1785 to the medical school of Vienna, where he attended the lectures of Van Swieten and Stoll, and in the same year received the degree of doctor. He gradually obtained success in his profession, with leisure for gardening and study. While a boy he had been struck with the differences of character and talents displayed by his companions, and after some time he observed, as he thought, that those students who excelled in committing pieces to memory all had large eyes. By degrees he suspected that the external peculiarities of the head corresponded to differences in the intellectual endowments and moral qualities, and disputed the theories of Aristotle, Van Helmont, Descartes, and Drelincourt, who fixed the soul respectively in the heart, the stomach,

the pineal gland, and the cerebellum. He began to examine the heads of those who had exhibited any striking mental peculiarity, in lunatic asylums, prisons, seats of learning, &c. He extended his observations to animals, and finally sought confirmation in the anatomy of the brain, of which he was the first to perceive the true structure. After 20 years he conceived that he had determined the intellectual dispositions corresponding to about 20 organs, that he had found the seats of these original faculties in the brain, and that they formed prominences or protuberances on the skull proportionate to their degree of activity. In 1791 he published the first volume of a general medical work, and in 1796 began to lecture on his peculiar theory in Vienna, where its novelty made a great sensation. The first written account of it appeared in a letter published in *Der deutsche Mercur* of Wieland in 1798. About this time he gained his best disciple, Spurzheim, who gave great aid in the development and popular exposition of the doctrine. Dr. Gall continued his lectures till in 1802 they were interdicted by the Austrian government as dangerous to religion. He quitted Vienna in 1805, and in company with Spurzheim, who was his associate till 1818, travelled in central and northern Europe, lecturing in the principal, especially the university towns, and arrived in Paris in 1807. He established himself there as a medical practitioner, and delivered a course of lectures before a large audience. His principles, however, met with much opposition. He presented to the institute in 1808 his *Recherches sur le système nerveux en général, et sur celui du cerveau en particulier*, and published it in the following year. In 1823 he made a short visit to London, where the receipts from his lectures were less than the expenses. The most elaborate of his works is the *Anatomie et physiologie du système nerveux* (4 vols., Paris, 1810-'19), a second edition of which was published in 6 vols., each bearing a different title. An English translation of the whole work by Winslow J. Lewis, jr., M. D., was published in Boston (6 vols., 1835).

GALLAGHER, William D., an American journalist and poet, born in Philadelphia in August, 1808. He went in 1816 to Cincinnati, where in 1825 he entered the printing office of a newspaper. He wrote occasionally for the press, and became editor successively of the "Backwoodsman" at Xenia, O. (1830), the "Cincinnati Mirror" (1831), the "Western Literary Journal and Monthly Review" (1836), the "Hesperian," a Monthly Miscellany of General Literature" (1838), and in 1839 associate editor of the "Cincinnati Gazette," in which position he remained till 1850. He published three small volumes of poetry (1835-'7), each entitled "Erato," the principal pieces in which are "The Penitent," "The Conqueror," and "Cadwallen." In 1841 he published a volume of "Selections from the Poetical Literature of the West," and in 1846 a select edition of his

poems. When Thomas Corwin became secretary of the treasury in 1850, Mr. Gallagher accompanied him to Washington as his confidential clerk. In 1858 he removed to Louisville, Ky., and became one of the editors of the "Daily Courier." He afterward took up his residence on a farm near the city, and employed himself in writing on agriculture. During the civil war he was again in the service of the treasury department.

GALLAIT, Louis, a Belgian historical painter, born in Tournay in 1810. He spent several years in studying his art in Paris. Among his pictures most celebrated and popular in Belgium are one illustrating the last honors paid to Egmont and Horn after their execution, which has been purchased by his native city, and one representing the last moments of Egmont (1853). His "Abdication of Charles V." is in the court of cassation of Brussels, and his "Montaigne visiting Tasso," which established his reputation in 1833, is in the possession of the king of Belgium. His "Temptation of St. Anthony" was presented by Leopold to Prince Albert. Many of his pictures have been exhibited and admired in Paris and London. In 1870 he was made an associate member of the academy of fine arts of Paris.

GALLAND, Antoine, a French antiquary and linguist, born near Montdidier, in Picardy, April 4, 1646, died in Paris, Feb. 17, 1715. He became attached to the French embassy at Constantinople in 1670, visited Jerusalem, and copied there a great number of inscriptions, several of which Montfaucon published in his *Palaeographia Græca*. Returning to France in 1675, he made two voyages to the Levant to collect medals, coins, &c. He was afterward appointed antiquary to the king. In 1709 he became professor of Arabic in the royal college of France. His works are very numerous, but the most popular of them all is his translation into French of the "Tales of the Thousand and One Nights" (12 vols., Paris, 1704-'17; best ed. by Oussein de Perceval, 9 vols. 18mo), the famous "Arabian Nights' Entertainments," which he introduced to the knowledge of Europe. For some time they were thought to be inventions of his own.

GALLAS, an African race, generally classed with the Ethiopic division of the Semitic family, inhabiting portions of Abyssinia and the regions S. of it to the equator. Their skin varies between light and dark brown; their hair is somewhat frizzled, but without being woolly; their faces are round, their eyes small, and their figures tall and broad. Many of them consider themselves Mohammedans, but have no well defined conception of the faith they profess. Some have been converted to Christianity, and the Roman Catholic church maintains among them a mission headed by a vicar apostolic. Those who have remained pagans make pilgrimages to sacred trees on the banks of the Hawash, on the S. E. boundary of Shoa, and elsewhere, but believe in a future state of

reward and punishment. The Abyssinians narrate that this race descended from an Abyssinian princess who was given in marriage to a slave, and had seven sons who became founders of tribes. They first appear in history as invaders of Abyssinia, where they succeeded in establishing a permanent settlement. They are classed with the Semitic family on account of their language, though its Semitic character is not quite clearly defined. Whether they possess a graphic system has not been decided to a certainty. D'Abbadie sent a letter to Paris which he supposed to be written in Galla characters, but it has not been deciphered. Krapf has published an outline of the Galla language (London, 1842), in which he maintains that it does not contain a sound which cannot be expressed in English letters, even better than in Ethiopian. This assertion seems however doubtful, and Karl Tutschek has found it needful in his "Dictionary of the Galla Language" (Munich, 1844) to use several signs not found in our alphabet. The Gallas have, for instance, an entirely unaspirated *t* which is nevertheless intermediate between *t* and *d*, and also a *p* and an *l* so peculiar that the English can hardly pronounce them.—See Brenner's description and map in Petermann's *Geographische Mittheilungen* (Gotha, 1868).

GALLAS, Matthias von, count, a German soldier, born in 1589, died in Vienna in 1647. He belonged to an ancient family of the district of Trent, and acquired military experience under Prince Bauffremont in the war between Spain and Savoy (1616). After the outbreak of the thirty years' war, he distinguished himself in Bohemia and in Tilly's campaign against Christian IV. of Denmark (1626), and became major general. Together with Altringer he captured Mantua in 1629, and they pillaged the city, most of the booty remaining in the possession of Gallas, who was made count and in 1631 field marshal. After having gained the confidence of Wallenstein and coöperated with him against Gustavus Adolphus near Nuremberg and at Lützen, he was said to have been the first to disclose to the emperor his chief's ambitious designs. It is certain that he was early aware of Wallenstein's impending disgrace, and was among those who refused to attend when he appealed to his officers at Pilsen. On Wallenstein's removal Gallas succeeded him, and was made duke of Friedland. When, after the assassination of Wallenstein (1634), the future emperor Ferdinand III. became his father's generalissimo, Gallas commanded under him, with Piccolomini, in the battle of Nördlingen; and the victory achieved there over Horn and Bernhard of Weimar resulted in the restoration of the S. W. part of Germany to the emperor's dominions. In 1637 he fought against Baner and Wrangel in Pomerania; but being obliged to retreat next year, he was removed from active service till 1643. He was again commander-in-chief for a short time in 1645, but without retrieving

his reputation. His male descendants became extinct in the middle of the 18th century, and Friedland, to which he had added large domains, passed by inheritance to Count Clam, who took the name of Clam-Gallas.

GALLATIN. I. A N. county of Kentucky, separated from Indiana by the Ohio river; area, about 150 sq. m.; pop. in 1870, 5,074, of whom 600 were colored. It is diversified by well wooded hills, and abounds in blue or Trenton limestone. The Louisville and Cincinnati railroad traverses the S. part. The chief productions in 1870 were 46,675 bushels of wheat, 277,140 of Indian corn, 23,890 of oats, 32,070 of potatoes, and 157,050 lbs. of tobacco. There were 1,754 horses, 968 milch cows, 1,871 other cattle, 3,239 sheep, and 8,128 swine; 2 flour mills, 2 saw mills, and 1 distillery. Capital, Warsaw. II. A S. E. county of Illinois, drained by Saline creek, separated from Kentucky by the Ohio river and from Indiana by the Wabash; area, 810 sq. m.; pop. in 1870, 11,134. It consists mostly of forest land, has a fertile soil, and contains valuable salt springs. The chief productions in 1870 were 88,098 bushels of wheat, 509,491 of Indian corn, 27,164 of oats, 22,657 of potatoes, 18,051 lbs. of wool, 110,925 of tobacco, and 2,252 tons of hay. There were 3,016 horses, 2,095 milch cows, 2,930 other cattle, 7,204 sheep, and 14,985 swine; 3 manufactories of carriages and wagons, 3 of saddlery and harness, 1 of salt, 4 flour mills, 2 saw mills, and 1 tannery. Capital, Shawneetown. III. A S. county of Montana, bordering on Idaho and Wyoming, and intersected by Yellowstone river; area, 6,800 sq. m.; pop. in 1870, 1,578. Jefferson, Madison, and Gallatin rivers unite in the N. W. part and form the Missouri. It contains the most productive land in the territory. The chief productions in 1870 were 87,676 bushels of wheat, 68,520 of oats, 37,530 of barley, 13,388 of potatoes, and 2,905 tons of hay. There were 431 horses and 5,214 cattle. Capital, Bozeman.

GALLATIN, Albert, an American statesman, born in Geneva, Switzerland, Jan. 29, 1761, died at Astoria, N. Y., Aug. 12, 1849. His original name was Abraham Albert Alphonse de Gallatin. His father was a councillor of state, and a connection of the celebrated Necker. Albert graduated at the university of Geneva in 1779, and the next year embarked for America. He landed at Cape Ann and went to Maine, where he enlisted in the continental army, and was soon after placed in command of the fort at Passamaquoddy. In 1783 he taught French in Harvard college, and in 1784 he purchased a large tract of land in Virginia for the purpose of forming a settlement, but was deterred from his undertaking by the hostilities of the Indians. While surveying these lands he first met Washington, who also owned large estates in that region. Washington was seated in a land agent's log cabin, surrounded by a number of squatters and hunters, whom he was

examining with a view to ascertain the best route for a road across the Alleghanies. Gallatin stood in the crowd looking on for some time, while Washington put his questions with slowness and deliberation, and carefully noted down the answers. It was soon evident to the quick-minded Swiss that there was but one practicable pass. He grew impatient at Washington's slowness in coming to a conclusion, and suddenly cried out: "Oh, it's plain enough that [naming the place] is the most practicable." The bystanders stared with astonishment, and Washington, laying down his pen, looked at him in evident displeasure, but did not speak. Presently he resumed his pen, put a few more questions, then suddenly threw down his pen, and, turning to Gallatin, said: "You are right, sir." After Gallatin went out Washington inquired about him, made his acquaintance, and urged him to become his land agent. Gallatin declined the situation, and in 1786, by the advice of Patrick Henry, he purchased land on the banks of the Monongahela in Fayette co., Pa., settled there, became naturalized, and devoted himself to agriculture. In 1789 he was a member of the convention to revise the constitution of the state, and in the two succeeding years was a member of the legislature, to which he was chosen as the candidate of the republican or democratic party. In 1793 the legislature elected him United States senator. He took his seat, but his right to it was contested, and at the end of two months he was declared to have been ineligible, on the ground that he had not been a citizen of the United States the nine years required by the constitution, as he did not take the oath of allegiance till 1785. Opposition to the excise laws having ripened in western Pennsylvania into the "whiskey insurrection" in 1794, Gallatin was instrumental, at considerable personal risk, in bringing about a peaceful accommodation between the government and the people. In recognition of his services he was elected to the house of representatives as a people's candidate, and continued a member of that body from 1795 to 1801. On April 26, 1796, he delivered a speech in which he showed himself to be an unflinching republican. He even went so far as to charge Washington and Jay with having pusillanimously surrendered the honor of their country. As this speech came from a man whose accent betrayed that he was of foreign birth, and whose youth indicated that he could not have arrived in the country much before the termination of the war, it exasperated the federalists, one of whom remarked in reply that "he could not feel thankful to the gentleman for coming all the way from Geneva to accuse Americans of pusillanimity." Mr. Gallatin participated in all the important debates in the house, and soon became the acknowledged leader of his party. On his motion the committee of ways and means was first organized as a standing committee of the house in

1795. He directed his attention particularly to financial questions, and besides maintaining his views in debate published two pamphlets, "A Sketch of Finances" (1796), and "Views of Public Debt," &c. (1800). He made important speeches on "Foreign Intercourse," March 1, 1798; on the "Alien Law," March 1, 1799; and on the "Navy Establishment," Feb. 9 and 11, 1799. On May 15, 1801, he was appointed by President Jefferson secretary of the treasury, which office he held under him and Madison till 1813. He was eminently successful in his management of the treasury department, and soon attained a reputation as one of the first financiers of the age. His annual reports exhibit great ability, and had the highest influence upon the general legislation of the republic. He opposed the increase of the national debt, and prepared the way for its gradual extinction. He systematized the mode of disposing of the public lands, and was a zealous advocate of internal improvements, particularly the national road and the coast survey. He also exercised great influence on the other departments of the government, and on the politics of the country. In 1809 President Madison offered him the state department, which he declined. He was opposed to going to war with Great Britain in 1812, and as a member of the cabinet exerted himself strenuously to restore amicable relations with the British government. An offer having been made by the Russian government to mediate between the United States and Great Britain, President Madison, March 8, 1813, nominated as ministers to negotiate, Gallatin, James A. Bayard of the senate, and John Quincy Adams, at that time American minister at St. Petersburg. Gallatin and Bayard in May sailed for St. Petersburg in a private ship, with a cartel from the British admiral, granted at the request of the Russian ambassador at Washington. The senate, on meeting in extra session a few weeks later, refused to confirm Gallatin's appointment, because it was incompatible with his secretaryship. The attempt at mediation resulted in nothing, but in January, 1814, an offer was received from the British government proposing a direct negotiation for peace. President Madison nominated as commissioners John Quincy Adams, Henry Clay, Jonathan Russell, Bayard, and Gallatin. Gallatin was still abroad, and to obviate the objection of the senate on account of his holding the office of secretary of the treasury, he resigned that post definitively. It was finally decided that the negotiations should be conducted at Ghent. In the discussions which resulted in the treaty of peace, Dec. 24, 1814, and in the commercial convention with Great Britain a short time afterward, Gallatin had a prominent and honorable share. In 1815 he was appointed minister to France, where he remained till 1823. During this period he was twice deputed on special missions of importance, to the Netherlands in 1817 and to Eng-

land in 1818. While in this office he rendered some essential service to Mr. Alexander Baring in the negotiation of a loan for the French government. Mr. Baring in return pressed him to take a part of the loan, offering him such advantages in it that without advancing any funds he could have realized a fortune. "I thank you," was Gallatin's reply; "I will not accept your obliging offer, because a man who has had the direction of the finances of his country as long as I have should not die rich." On his return from France he refused a seat in the cabinet, and declined to be a candidate for vice president, to which he was nominated by the democratic party. In 1826 he was appointed by President Adams envoy extraordinary to Great Britain. After negotiating several important commercial conventions, he returned to the United States in December, 1827, and took up his residence in the city of New York. Soon after his return he prepared the argument in behalf of the United States to be laid before the king of the Netherlands as an umpire on the Maine boundary question. In 1830 he was chosen president of the council of the university in New York. In 1831 he published "Considerations on the Currency and Banking System of the United States," in which he advocated the advantages of a regular bank of the United States. He was a member of the free trade convention at Philadelphia in 1831, and prepared for that body the memorial which was submitted to congress. From 1831 to 1839 he was president of the national bank in the city of New York, and on resigning the office was succeeded by his son James Gallatin. The remainder of his life was devoted to literature, and especially to historical and ethnological researches. In 1842 he was one of the chief founders, and was chosen first president, of the ethnological society. He was president of the New York historical society from 1843 till his death. During the controversy with Great Britain on the northeastern boundary, he published a pamphlet on the subject, which displayed great research. Again, in 1846, during the Oregon difficulties, he published letters on the "Oregon Question," distinguished by impartiality, moderation, and power of reasoning. He was strongly opposed to war, and during the war with Mexico he wrote a pamphlet of which 150,000 copies were printed, and which had a marked influence on public opinion. At an early period Mr. Gallatin turned his attention to the ethnological and philological characteristics of the American Indians. His first essay on this topic was written in 1823 at the request of Humboldt. He afterward published "Synopsis of the Indian Tribes within the United States, east of the Rocky Mountains, and in the British and Russian Possessions in North America," forming vol. ii. of the *Archæologia Americana* (American antiquarian society, Worcester, 1836); and the subject was one of the last that occupied him in a work on the

"Semi-Civilized Nations of Mexico, Yucatan, and Central America, with Conjectures on the Origin of Semi-Civilization in America," published by the American ethnological society (New York, 1845).

GALLAUDET. I. Thomas Hopkins, founder of the first institution in America for instruction of the deaf and dumb, born in Philadelphia, Dec. 10, 1787, died in Hartford, Conn., Sept. 9, 1851. He was of Huguenot descent, early removed with his parents to Hartford, and graduated at Yale college in 1805. He entered the theological seminary at Andover in 1811, and was licensed to preach in 1814, but soon became interested in the instruction of deaf mutes, and was appointed to superintend the establishment of an institution at Hartford for that purpose. In 1815 he visited London, Edinburgh, and Paris, and returned in 1816 with Laurent Clero as his assistant. (See *CLERO*.) The asylum went into operation in 1817 with a class of seven pupils. Dr. Gallaudet resigned his connection with it as principal on account of impaired health in 1830, but continued to be one of the directors. He afterward prepared various works to aid the education of the young, and in 1838 became chaplain of the Connecticut retreat for the insane, at Hartford, which office he retained till his death. He published a volume of "Discourses" (London, 1818), preached to an English congregation in Paris, a series of "Bible Stories for the Young," "The Child's Book of the Soul" (3d ed., 1850), "The Youth's Book of Natural Theology," and other similar works, and edited 6 vols. of the "Annals of the Deaf and Dumb" (Hartford). His biography, by Heman Humphrey, D. D., was published in New York in 1858. **II. Thomas**, an American clergyman, son of the preceding, born in Hartford, Conn., June 3, 1822. He was a professor in the New York institution for deaf mutes from 1843 to 1858. In 1850 he received orders in the Episcopal church, and in 1852 founded St. Ann's church for deaf mutes and their friends, for which a church edifice and rectory, in 18th street, near Fifth avenue, were purchased in 1859. Through his efforts and example church services for deaf mutes have also been established in Philadelphia, Baltimore, Albany, Boston, and other places. Dr. Gallaudet is a frequent contributor to the "American Annals of the Deaf and Dumb" and other periodicals. **III. Edward Miner**, LL. D., a deaf-mute instructor, brother of the preceding, born in Hartford, Feb. 5, 1837. He became a teacher in the Hartford asylum in 1856, and in 1857 organized at Washington, D. C., the Columbia institution for the deaf and dumb and the blind. This enterprise proved very successful, and in 1864 he initiated measures for the establishment of the national deaf-mute college, of which he became president and professor of moral and political science. In 1867 he visited the principal deaf-mute institutions of Europe, and on his return in 1868 published an elaborate report of his investigations.

GALL BLADDER, the pear-shaped membranous reservoir, situated in a slight depression on the lower surface of the right lobe of the liver, which contains the bile during the intervals of digestion. The larger extremity is directed forward and to the right; the body of the organ is adherent above to the substance of the liver by dense areolar tissue, free below, covered by the peritoneum, and resting upon the pylorus, duodenum, and right arch of the colon; the neck is narrow and continuous with the cystic duct, about an inch and a half long, which unites with the hepatic duct from the liver, of about the same length, to form the common bile duct (*ductus communis choledocus* of anatomists). It is composed of an external serous coat, a middle areolar contractile tissue, and an internal mucous membrane; the arteries are derived from the hepatic branch of the celiac axis, the nerves from the hepatic plexus, and the veins empty their contents into the vena portæ. The hepatic duct is formed by the junction of the two principal branches (one from each lobe), the result of the union of the numerous ramifications from the interior of the liver. During digestion the bile flows without obstruction into the duodenum, but in the intervals of this process, owing to the partial constriction of the common duct, a portion of the bile flows by the cystic duct backward into the gall bladder, whose office is essentially that of a reservoir, storing up a supply of the secretion in the intervals of digestion. The common duct is formed by the union of the hepatic and cystic ducts, and is about 3½ in. long, opening obliquely into the duodenum near its last curve, by an orifice in the middle of a slight elevation. The stimulus of the food opens the intestinal orifice, and bile is discharged both from the liver and the gall bladder during digestion, its passage being effected by the contraction of the walls of the gall bladder and the ducts. Ordinarily containing a few ounces, the gall bladder may be so distended as to contain several pints, and it may be so atrophied as to be little larger than a pea; these cases, and the fact of the absence of the reservoir in many animals, show that its physiological importance is not great. It is subject to ossification, cancer, and acute and chronic inflammation from the irritation of gall stones or extension of diseases from the intestine; its diseases may end in ulceration, and obliteration of the ducts. From its smallness and protected situation it is rarely directly wounded, though it is sometimes ruptured by great external violence. The gall bladder is absent in invertebrates, in which the bile ducts open directly into the digestive cavity; it is present in most fishes, all reptiles, and most birds. There seems to be no general law regulating its presence or absence in mammalia; it is wanting in many rodents (as the mouse), in the elephant, rhinoceros, tapir, camel, peccary, horse, stag, and dolphin; it is present in the monkeys, bats, carnivora, almost all edentates, and in many ruminants (as the ox, sheep,

goat, and antelope). In the *orycteropus* of the Cape of Good Hope, an animal related to the ant-eaters, there are two gall bladders. With the exception of the dolphins, it seems that all mammals in which it is absent are vegetable feeders.

GALLE, Johann Gottfried, a German astronomer, born at Pabsthaus, near Wittenberg, June 9, 1812. He studied at Wittenberg and Berlin, and became a teacher and subsequently an assistant at the observatory in the latter city, of which Encke was director. In 1839-'40, for the discovery of three new comets, he received medals from the king of Denmark and the Lalande prize from the French academy. A doctor's diploma was given to him after his publication in 1845 of *Triduum Roemeri*, relating to the observations of Ole Römer. In 1846 Leverrier applied to Galle for aid in searching for the planet which he supposed to exist beyond Uranus. With the assistance of a map just completed by Dr. Bemicke, Galle had the good fortune to be the first to detect this Leverrier planet, subsequently known as Neptune, on the evening of the very same day on which he had received the French astronomer's application (Sept. 23). Encke declared that theoretic astronomy had never before achieved so great a victory as on this occasion, and Galle received another Lalande prize from the French academy. In 1851 he was appointed professor of astronomy and director of the observatory at Breslau. Besides numerous contributions on the subject of astronomy and meteorology to scientific periodicals, he has published *Grundzüge der schlesischen Klimatologie* (Breslau, 1857), and an extensive supplement to Encke's *Kometentafel* (1868).

GALLETTI, Johann Georg August, a German historian and geographer, born in Altenburg, Aug. 19, 1750, died in Gotha, March 16, 1828. He was a professor at the gymnasium of Gotha from 1788 to 1819, and published several manuals of history. Among his larger works are *Kleine Weltgeschichte* (27 vols., Gotha, 1787-1819), and *Allgemeine Weltkunde* (Leipsic, 1807; 12th ed., Pesth, 1859-'61).

GALLEY (Fr. *galère*), a long, low, narrow vessel of war, propelled by oars and sails. The derivation of the word is uncertain, but it is generally supposed to be from *galea*, a helmet, either because it was used sometimes as a figurehead, or because the basket-like construction at the head of the mast, for the use of archers and slingers, was shaped like a helmet. The name was first applied under the Byzantine empire to this class of vessels, which the ancients designated, according to the number of banks of oars in each, biremes, triremes, quadriremes, &c. The first galleys were merely open boats, with a single rank of rowers on each side, and sometimes with a single mast and a square sail. The rowers were placed amidship and the fighting men in the bow and stern. Platforms for combatants were soon built on the forecastle and stern, and bulwarks

were raised for the protection of oarsmen; but it was not until the 3d or 4th century B. C. that the two platforms were connected so as to make a complete deck. The Egyptian war galleys of the 15th century B. C. differed very little in general construction from the Mediterranean galleys of the 17th century A. D. They were from 116 to 120 ft. long by 16 ft. wide, were propelled by both sails and oars, and were armed with a beak. They are represented sometimes with 22 oars on a side, always arranged in a single bank. According to Pliny, the Erythræans were the inventors of the bireme, or galley with two banks of oars; Thucydides ascribes the trireme, with three banks, to the Corinthians; the quadrireme, with four banks, is said by Pliny and Diodorus to have been built first by the Carthaginians; and Mnesigiton ascribes the quinquereme, with five banks, to the Salaminians. In the times of Alexander the Great and the Ptolemies, galleys of 12, 15, 20, and even 40 banks of oars were built, according to ancient writers. A vast deal of learning has been expended in attempts to explain the method of arrangement of these oar banks, but it is still an unsolved problem. Some scholars maintain that the several banks were actually placed one above the other, and others that the benches were in rising grades, like stairs; but those familiar with naval construction reject these theories. A more plausible one is that of L'Escalier, who supposes that the three banks of the trireme were arranged, not one above the other, but all in a line, one amidship, one abaft the mainmast, and one forward of the foremast; and that in the quinquereme two banks, one above the other, were put amidship, two aft, and one forward. The possibility of two superimposed banks is generally admitted, and some writers believe in three. On the column of Trajan is represented a trireme with three banks of oars one above another, but beyond this number we have no example. The Athenians used nothing but triremes for a long time, but in the 4th century B. C. quadriremes and quinqueremes were introduced. In the most flourishing state of their navy they seldom carried more than 10 fighting men in each galley, depending on superior seamanship and sinking an enemy by piercing him with the spur, rather than on overcoming him by a hand-to-hand conflict. The Romans adopted a different system when they built their first navy in the Punic wars. Of the 420 men in each quinquereme, 120 were combatants; and they fitted their galleys with a boarding bridge, by means of which an enemy's deck could be reached easily when the vessels were laid alongside of each other. Quinqueremes had usually two masts, each of which carried a square sail. These masts were lowered previous to going into action, and the galleys were manœuvred by oars alone. In time experience proved the superiority of lighter vessels, and the trireme gradually supplanted other forms and came to be recognized as

the best type of the war galley. The Roman trireme was about 105 ft. long by 11 wide, and was manned by 170 rowers. After the time of Julius Cæsar the trireme was 90 ft. by 10, differing from the Neapolitan and Maltese galleys, whose length seldom exceeded seven breadths. When propelled by both oars and sails their speed was very great, almost equaling at times that of the modern steamboat. In the ancient galleys each oar was pulled by a single man. The rowers were guided by the word of command or by the sound of a trumpet, and appropriate cries were adapted to each manœuvre. The Greeks sometimes had musicians who regulated the movements by singing or by playing the flute or harp. In place of a rudder, galleys were furnished with a large broad oar on each side of the stern, and sometimes with two on each side. The galleys which under the eastern empire took the place of the trireme were of similar construction, but a little lower. They had two decks and two banks of 25 oars on each side, making 100 in all, were armed with a beak, and furnished with various engines for throwing darts and stones, or for dropping heavy weights on the deck of an enemy. After the invention of Greek fire, tubes for spouting this liquid were fitted to the bow, and the bulwarks and deck were sometimes covered with raw hide to protect them from that thrown by an enemy. England under Alfred the Great excelled in her galleys, which carried from 40 to 60 rowers on each side. The forces of William the Conqueror were transported across the channel in galleys so small that they carried no more than 20 armed men besides the rowers. When Richard Cœur de Lion went to the Holy Land in 1190, he had, besides other ships, 88 war galleys; and the Saracens fought him with similar vessels. They differed very little from those of the early eastern empire. Geoffrey de Vinsauf describes them as long and graceful, not high out of water, with two decks and two banks of oars, and armed with a wooden spur shod with iron. A smaller and lighter vessel, with one bank of oars, used for despatch boats and for throwing Greek fire, was called a galleon. From this time onward galleys again played an important part in the Mediterranean. They were much used also in the northern seas. In 1295 Eric, king of Norway, furnished Philip the Fair 200 galleys for use in the war with Edward I. of England. In the 14th century and after galleys were divided generally into three classes. The largest were 162 ft. long on deck and 133 ft. on the keel, with 32 ft. beam and a stern post of 23 ft. They had three masts with one large lateen sail on each, and 32 oars on a side, arranged in a single tier, each oar being pulled by six or seven men. The deck projected beyond the hull, so that the rowing benches were on the outside, where they were protected by bulwarks and were sometimes housed over and sometimes covered with an awning. The middle of the vessel

from stem to stern was thus left clear. Galleys of the second class, or demi-galleys, were of similar construction, from 120 to 130 ft. long, 18 ft. beam, and from 9 to 10 ft. hold; they were furnished with two masts, and had 25 oars on each side. Quarter galleys had only from 12 to 16 oars on each side, and were of little utility excepting in fine weather. After the invention of gunpowder, the sharp beak for running down an enemy went out of use, and galleys were armed with cannon. The large vessels of the 15th century carried usually three batteries forward, in tiers, the lowest consisting of two 36-pounders, the second of two 24-pounders, and the highest of two small guns. Three 18-pounders were mounted also on each quarter. Demi-galleys carried five guns forward and a number of smaller ones on the sides and stern. The Venetian galeass (*galeazza*), one third larger than the ordinary galley, had a large towering structure on the stern, a castellated structure almost as massive on the bow, and was rowed by 800 galley slaves, whose oar benches were placed amidship. The galleon of this period was a sailing vessel. A small galley was called a galiot or galeotte. In 1540 Gustavus Vasa sent for Venetian workmen to build for him galeottes, galeres, and galeasses, which Olaus Magnus translates biremes, triremes, and quadriremes. Until near the close of the 18th century galleys made a part of the fleet of all maritime nations. They drew but little water, and were convenient for coast service; and in calms and light winds, which often prevail in the Mediterranean, they had the advantage over a sailing vessel, being able to keep on her quarter out of the range of her guns. The advancement in naval construction and in navigation, and the improvement in guns and gunnery, finally put an end to the use of this class of war ships, which had dominated the maritime world for more than 3,000 years.—In the most ancient times, to row in the galleys was considered honorable. Among the early Greeks oarsmen were generally voluntary recruits, but at a later period prisoners of war were put to this service. The Carthaginians manned their galleys with captive Mauritanians. The Roman oarsmen were at first citizens of the lower class, but eventually prisoners of war and slaves were also employed. A single doubtful passage in Valerius Maximus has led to the supposition that criminals were sometimes condemned by the Romans to the galleys, but it is probable that they were first used for that purpose under the Byzantine empire. In the middle ages the galley rowers were convicts and infidel prisoners, who were chained to the benches on which they sat. The Turks and Barbary corsairs retaliated, and captured Christians were put to the same labor. In the 16th and 17th centuries France, Spain, and the Italian republics made use of galleys as places of punishment for condemned criminals, who were called by the French *galériens*, and by the

English galley slaves. In France, Richelieu ordered the courts of justice to sentence criminals to the galleys in preference to other punishments, and even those who had committed capital crimes were thus utilized. In the reign of Louis XIV. nearly all convicts were condemned to this service; and in 1676 it was seriously proposed that vagrants should be thus disposed of, but Colbert refused to sanction the measure. At a later date this was carried into effect, and confirmed mendicants, poachers, and those convicted of the smallest crimes, were sent to the galleys. Even these did not suffice to man the benches, and various other means were resorted to. Criminals were sometimes purchased from countries that kept no galleys, slaves were bought from the Turks, and negroes were imported from Guinea. The marquis de Denonville, governor of New France, kidnapped Iroquois Indians for this service. This excited against the French a spirit of hate among the savages which culminated in the massacre of Lachine, and Louis XIV. found it necessary to send back in 1689 all who survived. From the beginning of the 17th century to the early part of the 18th heretics were particularly sought out and condemned to the galleys. Galley slaves were subjected to the greatest cruelties and indignities. Their heads and faces were shaved, and they rowed entirely naked, wearing a uniform only when in port. They were seldom released even when their term of service was accomplished. Henry IV. ordered the captains of the galleys to retain prisoners for six years, although condemned for a shorter time; and under Louis XIV. galley slaves sentenced for only two or three years were retained often for 15 or more. Criminals preferred mutilation and even death to labor in the galleys. In the Italian republics many free oarsmen were employed, who in their engagements agreed to be chained like the slaves, but their heads were not shaved and they were permitted to wear the moustache. These were mostly former criminals. This system was not adopted in France because the *bonnevoles*, as they were called, would not consent to be chained. In 1748 the officers of the French galleys, who had until then formed a separate corps, were merged in the royal marine. After this time convicts were employed at hard labor in the arsenals and on the public works, but it was not until 1791 that the detested name *galérien* went out of use.

GALLIA, a S. county of Ohio, separated from West Virginia by the Ohio river and drained by Raccoon and Symmes creeks; area about 420 sq. m.; pop. in 1870, 25,545. It has a rough surface, underlying which are beds of coal and iron. The soil is generally poor except in the vicinity of the Ohio. The chief productions in 1870 were 192,558 bushels of wheat, 626,038 of Indian corn, 135,686 of oats, 132,358 of potatoes, 488,623 lbs. of butter, 65,293 of wool, and 12,297 tons of hay. There

were 4,889 horses, 4,944 milch cows, 8,943 other cattle, 23,740 sheep, and 13,698 swine; 3 manufacturing of woollen goods, 1 of sashes, doors, and blinds, 1 of machinery, 1 of furniture, 1 of pig iron, 2 of iron castings, 2 tanneries, 2 currying establishments, 5 flour mills, 4 planing mills, and 6 saw mills. The county was settled by Frenchmen in 1790, whence its name. Capital, Gallipolis.

GALLIC ACID, a product of the decomposition of tannic acid or tannin, obtained in slender, silky needles or crystals. When pure, these are colorless, without odor, sour, and astringent. They are soluble in 100 parts of cold or 3 parts of boiling water, very soluble in alcohol, and less so in ether. Their solution decomposes by exposure to the air. The decomposition of the crystals dried at 212° F. is supposed to be represented by the formula $C_7H_5O_6$. Gallic acid is a useful reagent for detecting the presence of iron in solutions. It does not possess the property of the solution of galls of precipitating gelatine. The acid exists ready formed in the gall nut, in sumach, in valonia, and in a large number of other astringent vegetables, although the quantity in each is but small. Gallic acid is tribasic, and it forms three classes of salts; those of the heavy metals are generally insoluble. Several methods are in use for obtaining it, either directly from the galls or from the solution of tannic acid first extracted from them. The powdered galls are made into a paste with water, and exposed for some weeks to the air at a temperature of 70° to 75° F., water being occasionally added to keep the paste moist. The residue, after expressing the paste to free it from the liquid portion, is boiled in pure water, and filtered while hot; the crystals of gallic acid separate as the solution cools. They should be purified by redissolving and boiling with a little animal charcoal or filtering through the same. As the presence of the smallest quantity of sesquioxide of iron will cause the crystals to be colored, the charcoal should be purified, and the filtering paper be washed with dilute hydrochloric acid. Gallic acid is obtained from solution of tannic acid by precipitation with sulphuric acid, the mixture being heated to the boiling point, and allowed to stand a few days. When gallic acid is heated to 410° F. it is wholly volatilized and converted into pyro-gallic acid and carbonic anhydride. Pyro-gallic acid is used to remove free oxygen from gaseous mixtures and as a developer in photographic operations.—When swallowed, gallic acid is rapidly absorbed from the stomach into the blood, and remains in the blood unchanged. When tannic acid is swallowed, it undergoes the decomposition indicated above, either before or after absorption, into gallic acid; so that tannic acid becomes gallic acid in the blood. Hence gallic acid is used as an astringent internally in preference to tannic, and also because it is less irritating to the stomach and more agreeable to the taste. It is rapidly eliminated from the system, chiefly

by the kidneys. Two or three hours after a dose of it has been taken the whole or nearly the whole of the amount has left the system, so that to keep the patient steadily under its influence, it should be administered every three or four hours. It may be given in large and frequently repeated doses, with advantage, to check hæmorrhages, especially those from the chest or uterus. It has also been used with good results in diseases of the kidneys and bladder, the organs that are chiefly concerned in its elimination. It is of very little value as a local astringent or in cases of diarrhoea or dysentery. The dose of it varies from 5 to 15 grs. five or six times a day. It is best given dissolved in water. Those who prefer to do so may take it dry on the tongue.

GALLICAN CHURCH, a name sometimes used as merely signifying the Catholic church in France, while more commonly it is applied to that church only so far as it holds to certain national privileges, doctrines, and usages. Those who have advocated these distinguishing peculiarities, in opposition to Rome, have therefore generally been called the Gallican party, while their opponents were known as the Roman, papal, or, in modern times, the ultramontane party. In the church of France there was from the beginning a strong feeling of nationalism, the most important manifestation of which is found in the pragmatic sanction of St. Louis (Louis IX.), issued in 1269, which forbade the levying of moneys for the court of Rome without the royal consent, and fixed, independently of the pope, the cases in which appeals were allowed from ecclesiastical tribunals to the royal courts. The spirit of independence was strengthened by the decrees passed in the fourth and fifth sessions of the council of Constance, and those enacted by the council of Basel while in open revolt against the pope. Although these decrees were condemned by Roman pontiffs, they were adopted by France at the assembly of estates at Bourges in 1488, and promulgated in the pragmatic sanction of Charles VII., the fundamental law of the Gallican church. This placed the general council above the pope, forbade the paying of taxes to the pope for appointing bishops and prelates, and abolished the annates after the death of the then living pope. This sanction was repealed by Louis XI. in 1461, but restored by Charles VIII., and by Louis XII. through the edict of 1499. Its most important points were again changed by the concordat concluded in 1516 between Francis I. and Leo X., which granted most of the demands of the pope, and, notwithstanding the protestations of the parliaments and provincial estates, remained valid until the revolution of 1789. The Gallican church became almost entirely dependent upon the kings, who often found it to their interest to strengthen the Gallican rather than the Roman tendencies. Thus, some of the decrees of the council of Trent were not received by France, being

held to be incompatible with the laws of the kingdom and too favorable to the papal authority. The most important event in the history of Gallicanism is the "Declarations of the French clergy" (*Declarationes Cleri Gallicani*), which in 1682, by order of Louis XIV., was drawn up by Bossuet, and defined the liberties and doctrines of the Gallican church in the following four articles: 1, kings and princes are in temporal matters subject to no spiritual power, and the latter can never absolve subjects from the oath of obedience; 2, the pope is subject to the decisions of an ecumenical council; 3, the power of the pope is moreover limited, as far as France is concerned, by the established prescriptions and usages of the Gallican church; 4, also in matters of faith the decisions of the pope are not infallible when not confirmed by the consent of the whole church. These propositions were proclaimed by a royal ordinance, to which all the instructions of the theological schools were to be conformed; but in Rome they were publicly burned by the common executioner. Louis XIV., in order to restore peace with the head of the church, soon revoked them, but his revocation was not received among the laws of the French state or church, and the articles therefore remained valid, and formed the legal palladium of the Gallican party. The French revolution overthrew the whole Catholic church in France. Napoleon, as first consul of the republic, reestablished it as a state church by a concordat with Pius VII., in 1801. To the concordat he added, April 8, 1802, organic articles, which enacted that the proclamation of papal decrees depends upon the discretion of the government; that there shall always be an opportunity for an appeal to the council of state against the abuses of ecclesiastical power; and that the teachers in the seminaries shall be always bound by the four propositions of the Gallican clergy. The pope and a majority of the bishops protested against the validity of the organic articles, and a synod convoked in 1811 at Paris refused to declare the church of France independent of the pope. Louis XVIII. concluded, June 11, 1817, a new concordat, by which that of 1801 was abolished, and that of 1516 restored. As, however, the chamber of deputies refused to ratify it, the new concordat never received legal sanction. Although the clergy had no opportunity to declare themselves in synods and councils on the relation of the Gallican church to Rome, it was generally known that a majority were in favor of strengthening the union with Rome, and opposed to defending anything in the national church which was regarded by Rome as un-Catholic. The July revolution of 1830 had but little influence on the inner development of the Gallican church. Louis Philippe made as great concessions to the hierarchy as the origin of his own authority would allow. The bishops whom he appointed were mostly opposed to the Gallican

tendencies. An attempt in 1881 by the abbé Châtel to establish a religious association under the name of the French Catholic church (*église catholique française*), was at once regarded by the Catholics as being not a movement within but a secession from the national church. The establishment of the republic in 1848 gave the church a liberty in ecclesiastical and educational affairs which she had not enjoyed for centuries. For the first time within more than 100 years the bishops held provincial and diocesan councils. It appeared that a difference of views still existed between them concerning the relation of the French church to Rome; but it was no longer the same party division as formerly, the Gallican party of old being found to be almost extinct. All the bishops agreed that it was desirable to strengthen the union between Rome and France, especially in order to give to the national church greater strength to resist the encroachments of the secular power. One of the clearest proofs of the spirit now prevailing is the gradual introduction of the Roman liturgy into every French diocese. Under Napoleon III. the bishops claimed the right to meet without previous authorization in provincial councils; and the government, in order to avoid a conflict, permitted them to do so without deciding the legal question. Thiers, who as leader of the dynastic opposition under Louis Philippe had often insisted on the maintenance of the Gallican liberties, had as president in 1871-'8 political reasons to avoid all conflicts with the episcopate, which now more than ever is a unit in repudiating the principles of the old Gallicanism. Only a few prominent theologians protested in the name of the Gallican church against the definition of the pope's official infallibility; but after the proclamation of the decrees of the Vatican council, the dissentient French prelates gave in their adhesion.—Among the most important works on the Gallican church, its history and liberties, are: Count Joseph de Maistre, *Du Pape* (Lyons, 1819), and *De l'Église gallicane dans son rapport avec le souverain pontife* (Paris, 1821); Dupin, *Les libertés de l'Église gallicane* (Paris, 1824); and Frayssinous, *Les vrais principes de l'Église gallicane*.

GALLIENUS, *Publius Licinius Egnatius*, a Roman emperor, son of the emperor Valerian, born about A. D. 235, died in 268. On Valerian's accession to the throne in 253 he immediately associated his son with himself in the government with the title of Cæsar. The old emperor sent him, under the care of Postumus, governor of Gaul, to repel the incursions of the Franks and Alemanni on the upper Danube and the Rhine, where Gallienus displayed considerable ability and bravery. On hearing of his father's defeat and capture by Sapor, king of Persia (260), he made no effort to obtain his release, but succeeded with evident pleasure to his throne and title, and gave himself up to debauchery, viewing with like indifference the invasions of the empire by the barbarians and

its dismemberment by usurpers. The Franks overran Gaul and Spain, and even crossed over to Africa; the Alemanni ravaged the provinces of the upper Danube; the Goths pillaged the cities of Asia on the southern shore of the Euxine; and the Persians, after taking possession of Mesopotamia, passed over to Syria and captured Antioch. This was followed by the plague. Nearly 80 of his armies in different parts of the empire each elected their general to be emperor, and the military anarchy which succeeded has been called the age of the 80 tyrants. When the legions of Illyria in 268 proclaimed Aureolus emperor, he immediately marched on Rome. Gallienus, awakening from his apathy, marched against the usurper, defeated him in a battle near the Adda, and then besieged him in Milan, but was murdered by conspirators. Gallienus was a poet and rhetorician.

GALL INSECTS. See GALLS.

GALLINULE, a wading bird, of the suborder *gralla*, family *rallida*, and subfamily *gallinulina*; comprising the genera *porphyrio* (Briss.), *tribonyx* (Dubuis.) from Australia, *gallinula* (Briss.), and *fulica* (Linn.); the last has been described in the article COOT. In the genus *porphyrio* (Briss.), or *porphyryula* (Blyth), the bill is short, thick, and strong, with the culmen much elevated at the base, and dilated on the forehead, with a large frontal plate and compressed sides; nostrils nearly circular; the wings and tail are short and rounded, the second, third, and fourth quills nearly equal and longest; the tarsi long and slender, with broad transverse scales; the toes very long and free at the base, claws long and somewhat curved. More than a dozen species are described, richly colored, inhabiting warm and temperate regions in pairs or small flocks, on the borders of lakes, rivers, and marshes; they prefer land to water, walk in a dignified manner, run lightly and quickly, and from the length of the toes are able to glide over the surface of floating water plants; their food consists chiefly of fruit, seeds, aquatic roots, and small fish and mollusks; their nest is concealed in the high reeds near the water's edge, made of dry grasses, and the usual number of eggs is three or four. The only American species is the purple gallinule (*P. Martinica*, Linn.), with the head and lower parts fine bluish purple, darker and often nearly black on the abdomen and tibia; the sides and under wing coverts bluish green, and lower tail coverts white; upper part of body dark green shaded with olive, and tinged with brown on the back and rump; quills and tail brownish black, with green outer edging; bill bright red with yellow tip, frontal plate blue, iris bright carmine, tarsi, toes, and claws yellow. The length to end of tail is about 13 in., extent of wings 21½, tarsus 2½; weight about 8 oz. It is distributed over the southern states, and is accidental in the middle and northern; it is found also in South America. It runs, swims, dives,

and flies well; when travelling far its flight is high, but low and short in its feeding or breeding grounds; it alights with the wings spread upward like the rail; the rapid jerking motions of the tail when alarmed are very remarkable; it sometimes alights on ships 200

Purple Gallinule (*Porphyrio Martinica*).

or 300 miles from land. Its flesh is not generally held in estimation. It breeds at the south, very early in the year; the nest is built of rushes, 2 or 3 ft. from the ground, and is about 10 in. in diameter on the inside; the eggs, from five to seven, are of a light grayish yellow, with blackish brown spots; the young, at first nearly black, are fully fledged by the first of June.—In the genus *gallinula* (Briss.) the bill is shorter and less stout, the tarsi are stronger, and the toes are margined by a slight membrane throughout their length, though in no way comparable to the pedal lobes in the coot. There are about 12 species in various

Florida Gallinule (*Gallinula galeata*).

parts of the world, living on the borders of slow and deep streams edged with reeds; they are more aquatic than the preceding genus, preferring water to land, swimming well and striking the water with the tail; they are excellent fliers and divers, and swim under

water by means of their wings; they also walk well, flirting up their tails, and run swiftly among the reeds and through narrow places; they can pass lightly over the leaves of aquatic plants; they eat slugs, worms, insects, grains, &c.; the nest resembles that of *porphyrio*, the number of eggs is eight to ten, and the young take to the water as soon as hatched. The American species is the Florida gallinule (*G. galeata*, Licht.), very closely resembling the *G. chloropus* (Linn.) of Europe; the principal differences seem to be that in the American bird the frontal plate is quadrate instead of acute, and the toes are longer. The head, neck, and under parts are deep bluish gray, blackish on the head and neck, and lighter on the abdomen; few feathers on the sides edged with white; lower lid, lateral lower tail coverts, edge of wing at shoulder, and outer edge of first primary, white; back and wings deep olive, darker on the rump; quills dark brown; tail brownish black; frontal plate and bill bright red, tipped with yellow; bare space on the tibia next to the feathers red; rest of legs yellowish green. The length to end of tail is about 18 in., extent of wings 22; weight 12 oz. The female is like the male. This species is common in the winter along the rivers, ponds, and lakes, from eastern Florida to Texas, whence it migrates in spring and summer to the Carolinas, and occasionally even to the middle and northern states; it is also found in South America. It is both nocturnal and diurnal in its habits, often seeking for food on land, walking and nipping insects and grass like the common fowl; it is rarely seen on salt water, but sometimes in the winter visits the banks of bayous in which the water is brackish. The nest is generally a few feet from the water, among the rankest weeds; the eggs, about an inch and a half long, are of a dull dark cream color, with reddish brown and umber spots and dots; when the female leaves her nest she covers the eggs to protect them from crows and other enemies, and both sexes incubate; if not disturbed, they will hatch several broods in a season.

GALLIO, Junius, a brother of the philosopher Seneca, adopted by the rhetorician Junius Gallio, whose name he assumed, died in A. D. 65. In 53 and 54 he was proconsul of Achaia under Claudius, and resided at Corinth, where he refused to listen to charges brought by the Jews against the apostle Paul on "a question of words and names, and of your law" (Acts xviii. 12-17). According to Jerome, he committed suicide. From him the name of Gallionism has been applied to indifference to diversities of religion.

GALLIPOLI (anc. *Callipolis*), a town of Turkey, in the vilayet of Edirneh, 120 m. W. S. W. of Constantinople; pop. about 50,000. It is on a peninsula at the N. E. extremity of the Dardanelles, and was formerly well fortified. Its streets are narrow, dirty, and ill built, but its bazaars are large and abundantly supplied with

goods. It has many mosques, fountains, Roman and Byzantine ruins and monuments, and manufactures of cotton, silk, and fine morocco leather. It has two harbors, and frequently receives the imperial fleets. It is the seat of a Greek bishop. Gallipoli was formerly of great



Gallipoli.

importance as a centre of commerce and as the key of the Dardanelles. The commerce is still considerable in grain, wine, silk, and oil, chiefly in the hands of the Greeks. Gallipoli was captured by the Turks in 1857.

GALLIPOLI (anc. *Callipolis* or *Anza*), a fortified seaport town of Italy, in the province of Lecce, on an island in the gulf of Taranto, 29 m. W. S. W. of Otranto; pop. about 2,500. It is connected with a suburb on the mainland by a bridge, is well built, and has a castle, a fine cathedral, and several convents. The harbor is good, but difficult of access. Gallipoli has manufactures of woollen goods, muslin, and cotton stockings, and is the great mart for an inferior kind of olive oil known as Gallipoli oil, which is collected in large tanks excavated in the limestone rock. The town carries on a considerable trade, and the steamers plying between Ancona and Naples call here regularly. Many of the inhabitants are engaged in the tunny fisheries. Gallipoli is the seat of a bishop.

GALLIPOLIS, a city and the capital of Gallia co., Ohio, pleasantly situated on a high bluff on the Ohio river, 83 m. S. S. E. of Columbus; pop. in 1870, 3,711. It is surrounded by a fertile district, and contains manufactories of leather, woollens, and flour. There are several handsome public buildings, a bank, an academy, three weekly newspapers, and 17 public schools, including a high school. It was a depot of supplies during the civil war.

GALLISSONNIÈRE, Roland Michel Barria, marquis de la, a French admiral, born in Rochefort, Nov. 11, 1698, died at Nemours, Oct. 26, 1756. After rising through various grades in the navy, he was appointed governor general of Canada in 1747, that province being under the management of the navy department. He at

once studied the resources, wants, and advantages of Canada, and maintained its defence till the peace of Aix-la-Chapelle. His precautions then to secure all doubtful limits for France showed his energy. He endeavored in vain to obtain from government the establishment of a printing press in Canada. In 1749 he returned to France and was made commodore. He defeated Byng at Minorca in 1756. He was an able naval commander, a wise governor, and a devoted student of science.

GALLITZIN, *Goltzin*, or *Gallitzin*, a princely Russian family, numerous members of which have distinguished themselves as soldiers, statesmen, or authors. Their origin is traced to Gedemin, prince of Lithuania and the ancestor of the Jagi-

ellos.—**MIKHAIL** commanded in 1514 a Russian army against the Poles under Prince Ostrogski, was defeated, taken, and held in captivity for 88 years, together with his brother Dimitri, who died in the last year of their detention. Released by King Sigismund Augustus, Mikhail was received with distinction by the czar, but retired to a convent, where he died.—**VASIL** defended Novgorod against the first pseudo-Demetrius, but soon followed the example of Basmanoff in espousing the cause of the pretender (1605); murdered the son and widow of Boris Godunoff, his late master; was rewarded by the usurper, but conspired against him, and contributed to his fall and violent death (see **DEMETRIUS**); took part also in the conspiracy which overthrew his successor, Basil Shuiski, and was a chief member of the depuration which offered the throne of Moscow to Ladislas, the son of Sigismund III. of Poland. Offended by the conditions of the offer, the Polish king held the Russian envoys in arrest at Kiev, where Vasil died before the termination of the war between the two states.—**VASIL**, surnamed the Great, born in 1688, received a classical education, fought against the Turks, Crimean Tartars, and Cossacks, and was made attaman of the latter; was active in bringing about the great reforms of Czar Feodor Alexeyevitch; was treated after the death of that czar with particular distinction by his sister, the princess regent Sophia; concluded in 1686 a favorable treaty with Poland; commanded in a new expedition against the Tartars of the Crimea; promoted the ambitious designs of Sophia against her brother Peter the Great, and fell with her. He was banished first to Yarensk in the government of Vologda, and then to a dreary district in the government of Archangel, where he died.—**MIKHAIL**, born in

1674, served in the guards of Peter the Great, and accompanied that monarch on his various campaigns; distinguished himself at the taking of Schlasselburg; won a victory over the Swedes at Dobry in Lithuania (1708); defeated the reinforcements of Charles XII. under Gen. Löwenhaupt at Liesna; fought in the battle of Poltava (1709), and a few days after compelled the remnants of the Swedish army to surrender; accompanied the czar on his disastrous expedition to the Pruth (1711); and was sent as commander general to Finland, where he was victorious on land and sea, and remained till the peace of Nystadt (1721). He was made field marshal by Catharine I., was also distinguished during the reign of Peter II., and died in Moscow in December, 1730.—ALEXANDER, son of the preceding, born in November, 1718, served under Prince Eugene on the Rhine (1738), fought in the seven years' war, commanded a Russian army on the Dniester in 1768, took Khotin, and died in 1783.—DIMITRI, born in 1721, was ambassador to the court of Vienna, became by his will the founder of a magnificent hospital in Moscow, and died in 1793.—DIMITRI, born about 1735, was sent as ambassador to France in 1763, and in 1773 to the Hague; wrote on natural sciences, and died in 1803. Among his works are a *Description de la Tauride* (1788), and a *Traité de la minéralogie* (1792).—AMALIA, wife of the preceding, born in Berlin, Aug. 28, 1748, lived for a time in separation from her husband near the Hague, and subsequently at Münster in Westphalia, where she became the centre of a circle of pietistic writers, being herself remarkable for literary accomplishments as well as personal attractions. She contributed not only to the peculiar religious development of her son Demetrius (see GALLITZIN, DEMETRIUS AUGUSTINE), but also to the conversion of Count Friedrich von Stolberg to Catholicism. She died Aug. 24, 1806.—SERGEI fought against the Turks, under Potemkin, against the Poles in 1794, and against the Austrians in Galicia in 1809, commanding the troops which assisted the Poles to drive back the archduke Ferdinand, when he died.—EMANUIL, born in Paris in 1804, entered the Russian army, distinguished himself at the taking of Varna, returned to France, travelled through Russia and other countries, wrote, translated, and edited in French a number of works on Russia and its literature, especially descriptions of travels, and died at Paris in 1853.

GALLITZIN. I. Demetrius Augustine, a Russian missionary priest, son of Prince Dimitri Alexeyevitch Gallitzin and Amalia von Schmettau, born at the Hague, Dec. 22, 1770, died at Loreto, Pa., May 6, 1840. He and his sister Marianna were brought up by their mother, who when they were still very young was allowed by her husband to maintain a separate establishment in order to devote her whole time to their education and to indulge in her taste for metaphysical studies. As both parents pro-

fessed their unbelief in revelation, their son was at first reared in systematic ignorance of all religion. In 1783 a dangerous illness led the princess to examine the claims of Christianity, and in 1784 she was received into the Roman Catholic church by Dr. Overberg of Münster. In 1787 Demetrius also became a Catholic, and was first moved to be a priest by his intercourse with his young friends Caspar Maximilian and Clement August von Droste-Vischering. While yet a child he had been commissioned by Catharine II. as an officer of the imperial Russian guard, and all pains were taken to prepare him for the military profession. In 1792 he was sent to the United States both for the purpose of giving him a practical knowledge of free institutions, and with the hope of curing a natural timidity and nervousness amounting to disease. Accompanied by a former tutor in the Droste-Vischering family, Felix Brosius, he arrived in Baltimore Oct. 18, under the assumed name of Schmet or Smith. He was welcomed by Bishop Carroll, to whom he soon declared his determination to embrace the clerical profession for the benefit of the American mission. While awaiting the decision of his parents, he travelled through the country, visited the most distinguished American society, and applied himself to the careful study of the constitution, laws, manners, and geography of the United States. The opposition of both his parents did not alter his resolution; and after preparatory studies he was admitted a member of the congregation of St. Sulpicius in Baltimore in 1795, and in March, 1796, ordained priest. He exercised his priestly functions at Baltimore and at Conewago, Pa., till 1799, when he was sent at his own request to McGuire's settlement or Clearfield, in Cambria co., Pa. This settlement, then composed of a few Catholic families, was situated five miles from Summit, on the highest crest of the Alleghanies, and 200 miles from Philadelphia. On a plot of land given him by Capt. McGuire, an old revolutionary soldier, a substantial church arose, and by its side was built a log cabin for the missionary. He purchased in the immediate vicinity a large tract of land, destined to become the centre of a Catholic colony; it was divided into small farms and given to settlers at a nominal price. Thither he invited, in his own words, "families from Germany, Switzerland, Ireland, and different parts of America," and incurred great expense in establishing the most necessary trades. But at the death of his father the Russian court declared him disqualified to inherit the family estates; the remittances generously forwarded by his mother often miscarried, and the legacies she bequeathed to him in 1807 never reached him; while after the marriage of his sister in 1817 the large amounts justly due to him were appropriated by her husband. In spite of incredible difficulties he retained possession of his large property, on which he expended before his death \$150,000. To his pecuniary embarrassments

were added bitter persecutions from a portion of his flock; but he still labored unweariedly for their temporal and spiritual welfare. He was repeatedly designated for the episcopal office, but declined in order to perfect his cherished work. In 1802 he became a naturalized citizen of the United States, under the name of Smith; but in 1809 an act of the Pennsylvania legislature authorized him to resume his original name of Gallitzin. In 1803 he bestowed on the hamlet springing up around his church the name of Loretto. Cambria county, which he had found a wilderness in 1799, he left at his death studded with thrifty settlements, one of which has since been named after him. In 1850 his remains were placed in a vault in front of the church, and a monument was erected over them; and in 1878 measures were in progress to replace it with one more suitable. Controversial letters published by him occasionally in the local papers have been several times reprinted in pamphlets entitled "Defence of Catholic Principles," "Letter to a Protestant Friend," and "Appeal to the Protestant Public." His life has been written in German by his assistant Henry Lemke, and in English by Sarah M. Brownson (New York, 1878). His mother's life was written by Katercamp. II. **Elizabeth**, a cousin of the preceding, born in 1796, died in St. James parish, La., Dec. 8, 1848. After becoming a member of the Roman Catholic church, she joined the society of the Sacred Heart in Rome, and in 1840 came to America to visit the houses of the order. In the same year she founded the first school of the Sacred Heart in Houston street, New York, and afterward a boarding school and novitiate at McSherrytown, Pa., and a house at Pottawattamie village, in the far west.

GALLON, an old English measure of capacity, subdivided into 4 quarts, or 8 pints, or 32 gills. Formerly there were gallons of different capacities, one for wine, another for ale or beer, and a third for grain and dry articles. The wine gallon, called also the standard gallon, contained 231 cubic inches, the ale gallon 282 cubic inches, and the corn gallon 268.8 cubic inches. In 1824 the imperial gallon was established by the British parliament, by a statute which came into operation Jan. 1, 1826; its capacity was 10 lbs. avoirdupois of distilled water, that weighed 252.458 grains to the cubic inch, thus making its contents 277.274 cubic inches = 4.54846 litres. The gallon of the United States is the standard English wine gallon of 231 cubic inches, and contains 8.3388822 avoirdupois lbs. or 58,372.1754 troy grains of distilled water at 39.83° F., the barometer being at 30 inches. It is equal to 3.785207 litres. The gallon of the state of New York was formerly of the capacity of 8 lbs. of pure water at its maximum density, or 221.184 cubic inches; but it is now the same as the United States gallon.

GALLOWAY, Joseph, an American loyalist, born in Maryland about 1780, died in England,

Aug. 29, 1803. He was educated for the bar, and practised law successfully at Philadelphia. In 1764 he became a member of the Pennsylvania assembly, and joined Dr. Franklin in advocating the adoption of a royal government for the colony. In 1774 he was a delegate to the first congress, and proposed to settle the difficulties between the colonies and the mother country by vesting the government in a president general of the colonies, to be appointed by the king, and a council to be chosen by the several colonial assemblies; the British parliament to have the power of revising the acts of the latter body, which in its turn was to have a negative on British statutes relating to the colonies. He abandoned the whigs after the question of independence had begun to be agitated, and thenceforth was known as a zealous tory. He remained with the British army in Philadelphia and New Jersey till 1778, when he went with his daughter to England, where he passed the remainder of his life. Summoned in 1779 before a committee of the house of commons to testify on American affairs, he animadverted severely on the course of Gen. Howe and other British officers. A new edition of this "Examination" was published in Philadelphia in 1855 by the "Council of the Seventy-Six Society." His literary remains comprise a "Speech in answer to John Dickinson" (London and Philadelphia, 1764); "Candid Examination of the Mutual Claims of Great Britain and the Colonies" (New York, 1775); "Letters to a Nobleman" (1779); "Reply to Sir William Howe" (1780), &c.

GALLS, or *Katgalls*, excrescences growing on a species of small oak, *quercus infectoria*, inhabiting Asia Minor and the middle latitude of Asia. They originate from the puncture of a fly,

Galls on the Quercus infectoria.

which deposits its egg in the young boughs, the egg and afterward the fly being enclosed in the centre of the gall. The galls collected before the egg is hatched are called blue, green, or black, and are the most valuable. The white galls, which are collected later, are in-

jured by the insect. Galls reach the United States from Mediterranean ports and from Calcutta. They are nearly round, from the size of a pea to that of a very large cherry, with a surface usually studded with small tuberosities. The best are dark blue or green externally, lighter internally, hard and brittle, with a small cavity in the centre. Those of inferior quality are lighter in color, less hard, and contain a larger cavity communicating externally by a round hole through which the developed insect has escaped. Most if not all oaks contain a considerable amount of tannic acid, of that variety which precipitates the persalts of iron, blue-black. This acid seems to be concentrated in these pathological formations, constituting more than one half of their weight, and they are accordingly the source whence gallo- or quercu-tannic acid is most conveniently obtained. Galls have also been thought to contain smaller quantities of other allied acids, but it is probable that these are formed after the tannin and at its expense. All the soluble matter of galls is taken up by 40 times their weight of boiling water. Alcohol dissolves seven parts in ten, ether five. Galls are powerfully astringent, and may be used in medicine in the form of tincture or ointment, or in substance. For internal use, tannic or gallic acid is generally considered more convenient. The incompatibles of galls are very numerous, since the tannates of nearly all metallic oxides, alkalies, alkaline earths, and alkaloids are only slightly soluble in water. Nutgall ointment may be applied with advantage to hemorrhoids, but should not be used when the latter are inflamed. The dry substance is sometimes sprinkled over the surface of indolent ulcers or sores, to induce a healthy action in them.

GALL STONES. See CALCULI.

GALLUP, Joseph Adam, an American physician and author, born in Stonington, Conn., March 30, 1769, died in Woodstock, Vt., Oct. 12, 1849. He received a good education, and in 1798 graduated in medicine at Dartmouth college. He practised a few years in Hartland and Bethel, Vt., whence he removed to Woodstock in January, 1800. His first writings appeared in 1802 in the "Vermont Gazette," published at Windsor, and attracted much attention. From 1820 to 1823 he was president of the Castleton medical academy, and was also for several years a lecturer in the medical department of the university of Vermont. He established the clinical school of medicine at Woodstock, and delivered his first course of lectures there in the spring of 1827. This school afterward became the Vermont medical college, and was incorporated in 1835. In 1815 he published "Sketches of Epidemic Diseases in the State of Vermont," to which are added "Remarks on Pulmonary Consumption," which was republished in England. He published in 1822 "Pathological Reflections on the Supertonic State of Disease," besides other pamphlets, and in 1839 his more considerable

work in 2 vols., entitled "Outlines of the Institutes of Medicine."

GALT, a town of Waterloo co., Ontario, Canada, situated on both sides of Grand river, near the mouth of Mill creek, and on the Galt and Guelph branch of the Great Western railway, 54 m. W. S. W. of Toronto; pop. in 1871, 8,827. It is situated in a rich agricultural district, and contains many handsome buildings. The water power is extensive, and there are several large flouring and saw mills, iron foundries and machine shops, and manufactories of agricultural implements, leather, paper collars, hardware, woollens, &c.

GALT. I. John, a Scottish author, born in Irvine, Ayrshire, May 2, 1779, died in Greenock, April 11, 1839. After spending some years in mercantile life he began to study law, but in 1809 set out on a tour of nearly three years in southern Europe and the Mediterranean, publishing the results of his observations on his return in "Voyages and Travels" and "Letters from the Levant." He sailed from Gibraltar to Malta with Lord Byron and Mr. Hobhouse. Soon after his return he married Elizabeth, daughter of Dr. Tilloch, editor of the "Philosophical Magazine," and proprietor of the "Star" newspaper, on which Galt was for some time employed. He had contributed in 1803-'4 to "The Scots' Magazine" portions of an ambitious composition in octosyllabic verse. He next produced a volume of dramatic pieces, which Scott called "the worst tragedies ever seen," and this was followed by lives of Cardinal Wolsey and Benjamin West, "Reflections on Political and Commercial Subjects," a tragedy entitled "The Appeal," acted in Edinburgh for a few nights, and "The Earthquake," a novel. These works made no impression upon the public, but his "Ayrshire Legatees," which appeared in "Blackwood's Magazine" in 1820-'21, turned the popular tide in his favor. Within the next three years appeared "Annals of the Parish," generally esteemed his best work, "The Provost," which he himself preferred, "The Steamboat," "Sir Andrew Wylie," "The Gathering of the West," "The Entail," "Ringhan Gilhaize," "The Spaewife," "Rothelan," "The Omen," and "The Last of the Lairds," all novels of Scottish life, and all successful. In 1826 he visited Canada as the agent of the Canada company, a large landholding corporation; he founded the town of Guelph, but a difference with his employers having cast him adrift again, he returned to England in 1829, resumed his literary labors, and produced a number of novels and a variety of miscellanies, including a "Life of Lord Byron," the "Autobiography of John Galt" (2 vols., 1833), and "Literary Life and Miscellanies of John Galt" (3 vols., 1834). His novel "Lawrie Todd" (1830), relating some of his experiences in the new world, is considered in his best vein. It was followed by "Southennan," "Bogle Corbet," "Stanley Buxton," "The Member," "The Radical," "Eben Erskine," and "The

Lost Child. He died after 14 strokes of paralysis, having dictated compositions long after losing the use of every limb. His works are of very unequal merit, but are usually marked by an original quaintness and vigor and by defects of taste. **IL Sir Alexander Tilloch**, a Canadian financier, son of the preceding, born in Chelsea, England, Sept. 6, 1817. At the age of 16 he entered as a junior clerk the service of the British American land company, of whose estates he was sole manager from 1844 to 1856, raising the company from a condition of insolvency to one of prosperity. In conjunction with the Hon. A. N. Morin he established the Montreal and Portland railway, and was one of its chief managers until its union with the Grand Trunk railway. He has represented the city of Sherbrooke in the Canadian parliament since 1853. From the beginning of his political career he advocated the confederation of the British North American provinces and the establishment of an intercolonial railway. He entered the Cartier cabinet as minister of finance in 1858, after having declined the premiership, established a tariff which raised the provincial credit, negotiated in England the Canadian loan, and consolidated the debt. In 1860 he advocated the establishment of a bank of issue, but afterward withdrew his scheme, and succeeded in opening free ports at Gaspé and Saint Ste. Marie. He resigned with the Cartier ministry in 1862, returned to office with them in 1864, and retired in 1866. He was one of the commissioners sent to London to promote the confederation of the provinces, and was created in 1869 a knight commander of the order of Sts. Michael and George.

GALTON, Francis, an English traveller and author, born at Duddertown, near Birmingham, in 1822. He studied medicine at Birmingham, and afterward at King's college, London, and graduated at Trinity college, Cambridge, in 1844. In 1846 he travelled in north Africa and on the White Nile, and subsequently made a journey of exploration from Walfish bay through the western regions of south Africa. For his account of this journey he received the gold medal of the royal geographical society in 1852, and subsequently became secretary and later vice president of that society. From 1863 to 1868 he was general secretary of the British association, and he is now (1874) one of the managing committee of the meteorological office. He has published "Travels in Tropical South Africa" (1853); "Meteorographica, or Methods of Mapping the Weather" (1863); "Art of Travel, or Shifts and Contrivances available in Wild Countries" (1867); and "Hereditary Genius, its Laws and Consequences" (1869). He has also edited "Vacation Tourists and Notes of Travel in 1860-'63" (3 vols., Cambridge, 1861-'4).

GALUPPI, Baldamare, an Italian musician, surnamed **BURANELLO**, born on the island of Burano, near Venice, in 1708, died there in January, 1785. He received instruction from his

father and from the composer Lotti, became chapelmaster of the church of St. Mark and president of the conservatory of the *incurabili*, and spent some time in St. Petersburg. He produced his first comic opera in 1721 without success, but applied himself with greater zeal to composition, and his opera *La fede nell'inconstanza*, performed in 1729, made him famous. He composed more than 70 operas, and has been called the father of Italian comic opera; he also composed many masses, oratorios, &c.

GALUPPI, or **Galluppi**, **Pasquale**, an Italian philosopher, born at Tropea, Calabria, April 2, 1770, died in Naples, Dec. 13, 1846. He studied at the university of Naples, and was professor of philosophy there for many years. He was a spiritualist in psychology, and was the first among the modern philosophers of Italy to coincide with Kant in considering the promptings of the moral law as paramount in ethical psychology. He rejected the doctrine of *Helvétius*, which bases morality on the desire for pleasure, and the theories of *Wolf* and *Romagnosi*, who find the essence of it in the yearning after perfection. His principal works are: *Saggio filosofico sulla critica della conoscenza* (Naples, 1819-'32); *Lettere filosofiche sulle vicende della filosofia intorno ai principii della conoscenza umana da Cartesio fino a Kant* (1827; 2d ed., 1838); *Elementi di filosofia* (4th ed., 5 vols., 1835-'42); *Lezioni di logica e di metafisica* (5 vols., 1832-'6; new ed., 1842); *Considerazioni sull'idealismo trascendentale e sul razionalismo assoluto* (1841); and *Elementi di teologia naturale* (4th ed., 1844).

GALVANI, Alesio or **Luigi**, an Italian physician, born in Bologna, Sept. 9, 1737, died there, Dec. 4, 1798. He was educated for the priesthood; but his tastes inclined toward the natural sciences, and abandoning theology he took the degree of M.D. at the university of Bologna in 1762. Soon afterward he was appointed medical lecturer at the institute of Bologna, and published treatises on the urinary organs and the organs of hearing in birds. In 1786 accident led him to his great discovery in physical science (see **ANIMAL ELECTRICITY**, and **GALVANISM**), and in 1791 he published *De Viribus Electricitatis in Motu Musculari Commentarius*. Having refused to swear allegiance to the Cisalpine republic in 1797, he was deprived of his offices, and his health began to decline. The death of his wife also afflicted him greatly. Under the weight of these misfortunes he sank rapidly, and although his offices were subsequently restored to him, he died before resuming their duties.

GALVANISM, or **Voltaic Electricity** (so named from its discoverers, *Galvani* of Bologna and *Volta* of Pavia), that form of dynamical electricity which is developed by chemical action. An account of the discovery of *Galvani* is given under **ANIMAL ELECTRICITY**, and also a notice of the controversy which was carried on between these philosophers, *Galvani* maintaining that the peculiar phenomena which he produced

were owing to electricity developed in the animals on which he experimented, and Volta contending that they were due to the contact of dissimilar metals. Galvani may therefore be regarded as more particularly the discoverer of animal electricity, while Volta, who did not invent the celebrated pile which bears his name till 1799, the year after the death of Galvani, is entitled to most of the credit of the discovery of chemical or galvanic electricity. The term dynamical electricity is often applied to galvanism, but it has a wider meaning, and embraces the phenomena of all electrical currents, irrespective of their origin. Volta's theory that the galvanic current was produced by the contact of two dissimilar metals is not held by the majority of the scientific world at the present day. The earlier experiments which seemed to support that doctrine were imperfectly performed, and when chemical action or other external force is strictly excluded, no electrical effects can be produced. Fabroni of Florence is said to have been the first to suggest chemical action as a principal cause of the phenomena, an opinion formed from observing the rapid oxidation which took place in the zinc plates of the voltaic pile. This opinion was supported by Sir Humphry Davy in England, who soon after the publication of a letter of Volta to Sir Joseph Banks in 1800, giving an account of his battery, made numerous interesting experiments. Wollaston advocated the chemical theory, and also showed the identity of the electricity of the pile and that of the frictional machine by reducing the electrodes of the latter to small points, and causing the current which passed through them from a large machine to produce chemical decomposition and other similar effects. In 1807 Davy obtained the metals potassium and sodium by electrolysis, and in 1809 Deluc made dry piles of gold and silver paper, which were afterward improved by Zamboni. In 1819 Oersted discovered the deflection of the magnetic needle by the galvanic current, and soon afterward Ampère announced a theory which explained its action. (See ELECTRO-MAGNETISM.) In 1827 Ohm of Munich enunciated the celebrated law which bears his name, and developed a strictly mathematical theory. Faraday in 1831 discovered the induction of galvanic currents by means of magnetism, and continued his investigations till near the close of his life, making many remarkable discoveries, among them the law of definite electro-chemical decomposition. From 1836 to the present time many improved modifications of galvanic batteries have been devised by Daniell, Grove, Bunsen, and others, which, although of minor importance when compared with discoveries and developments of great principles, have been of much advantage in the prosecution of various branches of scientific research and in the arts.—The ordinary phenomena of galvanism may be observed by the following simple experiments: If a plate of commercial zinc is

placed in a glass vessel containing dilute hydrochloric acid, chemical action will take place, accompanied with the evolution of bubbles of hydrogen gas upon the surface of the plate, which successively form and rise to the surface of the liquid, and upon examination chloride of zinc will be found in solution. If a plate of copper is placed in the liquid near the zinc and brought into contact or connected by a wire with it, as shown in fig. 1, the evolution

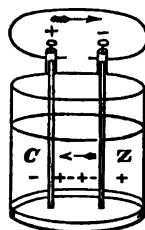


FIG. 1.

of hydrogen upon the surface of the zinc plate will mostly cease and be transferred to the surface of the copper; but chlorine will continue to unite with the zinc, which metal, if weighed, will be found to have lost weight, while the copper will neither have lost nor gained. If, in the first place, when the zinc plate alone was immersed in the acid, pure metal had been used, there would not have

been so much chemical action; but upon the introduction and connection of the plate of copper there would have been more, and the evolution of hydrogen gas would have been entirely confined to the surface of the copper. If a plate of iron is placed in dilute hydrochloric acid, it will dissolve with evolution of hydrogen and the formation of chloride of iron, the action being the same as with the employment of zinc; and if a copper plate is connected with it, the action will still be similar to that which is obtained between the zinc and copper; but if a zinc instead of a copper plate is placed near the iron and connected with it, the action upon the respective plates will be reversed. The hydrogen will continue to be evolved at the surface of the iron, but this metal will cease to combine with chlorine, the chemical action being transferred to the zinc plate. In either of these experiments, when chemical action takes place wholly or principally upon one metal, if a magnetic needle is brought near the connecting wire it will be observed that a peculiar force is exerted upon it, tending to make it take a position at right angles to the wire, turning one way or the other, according to the position of the latter, and the relative connections of the copper and zinc plates. If a very fine platinum wire forms a part of the connection, its temperature will be raised; and if the apparatus works energetically, it may become incandescent, or even fused. If contact is broken in any part of the connecting wire, a minute spark, especially if the room is darkened, may be observed at the point of separation, which resembles the spark of the ordinary frictional electrical machine, and may be shown to have similar properties. After separation the plates will not present the same appearance as during connection; but the evolution of hydrogen gas on the surface of the

copper will cease, and if the ends of the wires are examined with a delicate galvanoscope or electroscopes, they will be found to contain a small charge of statical electricity, the one connected with the copper plate being in a positive, and the one connected with the zinc plate in a negative condition. If the disconnected ends of the wires are dipped near to each other in a small cup containing a solution of iodide of potassium, the salt will be decomposed; a fact which offers strong evidence against the contact theory. If, in the above experiments, sulphuric instead of hydrochloric acid is used, the same phenomena will appear; but instead of chloride, sulphate of zinc will be found in solution. A system consisting of two metals immersed in a fluid which chemically acts upon one of them, is called a simple galvanic or voltaic couple, or element. When the plates are disconnected the couple is said to be open, and when connected by a conductor it is said to be closed, forming a circuit, which is also spoken of as open or closed. When the circuit is closed it is assumed that a current of positive electricity passes through it from the zinc to the copper in the liquid, and from the copper to the zinc out of the liquid. It is assumed that the current passes in this direction because when the end of the wire which is connected with the copper plate is examined with the electroscopes, positive electricity is found upon it; and also from the fact that the needle of a galvanometer, when one of the electrodes of the instrument is connected with the copper and the other with the zinc plate, is deflected in the same direction as when they are respectively connected with the prime conductor and rubber plate of an ordinary glass-plate electrical machine. It may be assumed, moreover, that a current of negative electricity passes at the same time in the opposite direction; but for convenience of explanation this assumed action is not taken into consideration. The use of the word current has its advantages, and helps to convey ideas which are in accordance with observed effects; but the actual passage of a fluid in either direction is a matter of doubt, and in the opinion of Faraday does not take place, he believing that the resulting phenomena are caused by a polarization of the molecules of the medium. The action which is called a voltaic current does not require that one of the metallic elements shall not be at all acted upon by the liquid, but only that the action shall be greater upon one than upon the other; the metal most acted upon being the positive or generating plate. Generally the polarization which results from the connection of two metals when immersed in a dilute acid or saline solution, although either might be acted upon by it separately, causes one to become more and the other less positive, or in other words, more negative, so that it becomes protected. On this principle iron is often protected from corrosive action by coating it with

zinc, and the copper bottoms of ships have been in a similar manner protected from the action of sea water by attaching to them a more positive metal. The force which results from a difference in chemical action of a liquid on two metals is called the electromotive force, and its quantity depends not only upon the relative attraction of the metals for constituents of the liquid, but also upon the distance of the plates from each other. That metal which has the strongest affinity for oxygen is usually the most electro-positive, and one metal may therefore bear an electro-positive relation to a second, while it is electro-negative when compared to a third. Potassium is the most electro-positive of all bodies, but its attraction for oxygen is so violent as to make it practically useless as an element in the galvanic circuit. Among those which can be usefully employed as electro-positive elements, zinc ranks first, while platinum is the most highly electro-negative metal. But the relative electrical condition of several of the metals changes when immersed in different liquids; thus if an iron and a copper plate be connected with the electrodes of a galvanometer and immersed in dilute sulphuric acid, the needle will be deflected in one direction; while if the plates are immersed in a solution of sulphide of potassium, the deflection will be in the opposite direction. The following table shows a few of the results obtained by Faraday:

COMPARISON OF DIFFERENT METALS IN THE PRESENCE OF DIFFERENT LIQUIDS.

Dilute sulph. acid.	Hydrochloric acid.	Sol. of potash.	Sol. sulphide of potash.
Silver.	Antimony.	Silver.	Iron.
Copper.	Silver.	Nickel.	Nickel.
Antimony.	Nickel.	Copper.	Bismuth.
Bismuth.	Bismuth.	Iron.	Lead.
Nickel.	Copper.	Bismuth.	Silver.
Iron.	Lead.	Iron.	Antimony.
Lead.	Lead.	Antimony.	Tin.
Tin.	Tin.	Cadmium.	Copper.
Cadmium.	Cadmium.	Tin.	Zinc.
Zinc.	Zinc.	Zinc.	Cadmium.

The order in each column places the most positive metal in regard to the fluid at the bottom, and the most electro-negative at the top. It has been demonstrated by Poggendorff that the electromotive force between any two metals is equal to the sum of the electromotive forces between all the intervening metals.—The theory of the production of the galvanic current is as follows: When a zinc and a copper plate are immersed in dilute acid, they immediately become polarized, assuming opposite electrical states, that end of the wire, as has been observed, connected with the copper plate showing positive, and that in connection with the zinc negative electricity, while those portions of the copper and zinc plates which are in the liquid are respectively in a negative and a positive state. The compound molecules of the liquid are also supposed to assume a highly polarized condition; one constituent becoming

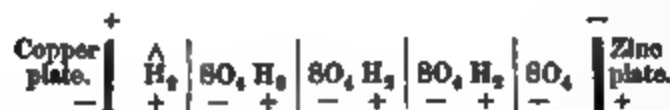
negative and attracted by the zinc, and the other positive and attracted by the copper plate. Let us suppose the liquid to be hydrochloric acid; the electrical condition and chemical action which take place may be represented as follows:



The polarization of the molecules of the acid becomes intensified by the presence of the two oppositely electrified metals; and conversely, the two metals have the difference in their electrical states intensified by the action of the acid molecules. When the copper and zinc plates are connected by a wire out of the fluid, their polarity becomes so intensified that the constituents of the molecules of hydrochloric acid are drawn asunder, the negative chlorine being attracted by the positive zinc, and the positive hydrogen by the negative copper plate. Union takes place between the chlorine and zinc, forming chloride of zinc, which dissolves in the water; but the hydrogen which is attracted by the copper plate does not unite with it, but rises in bubbles along its surface to the top of the liquid. This evolution of the hydrogen at the copper plate, and not at the point where the chlorine leaves the acid and unites with the zinc, can only be explained by supposing that when this action takes place there is at the same time an interchange of constituents in the intervening chain of molecules lying between the two plates, such as is represented in the diagram above. When the exciting liquid is dilute sulphuric acid, it was formerly supposed that water was the electrolyte or body decomposed, its oxygen uniting with the zinc to form oxide of zinc, which subsequently united with sulphuric acid to form sulphate of zinc, while the hydrogen of the water escaped at the surface of the copper plate; thus:



But it is now believed that it is the sulphuric acid, now written H_2SO_4 , which is the subject of decomposition, the action being as follows:



Modern theory regards the zinc as combining directly with the body SO_4 or oxysulphion, without preliminary oxidation. In electrolysis where the two plates form the electrodes of a battery, and are composed of metals neither of which combines with the liquid, the case is different, and both water and sulphuric acid are decomposed, as will be subsequently shown.—*Voltaic Batteries.* A battery consists of a combination of two or more couples for the purpose of increasing the electromotive force, each

additional couple adding its force to that of the battery. This idea presented itself to Volta when he invented the pile which bears

his name. It may be constructed by laying upon a bottom piece of wood a disk of copper, and upon this a disk of cloth moistened with dilute acid or a solution of some salt, and upon this a disk of zinc, and repeating this order to an indefinite extent, one end of the battery terminating in a copper and the other in a zinc disk; the order of the elements being copper, fluid, zinc, copper, fluid, zinc, in one direction, and zinc, fluid, copper, zinc, fluid, copper, in the other; so that it is immaterial whether the pile is commenced with copper or with zinc, the positive current, when the terminal plates are connected by a wire, always flowing from the copper to the zinc

FIG. 2.—Voltaic Pile.

through the wire, and from the zinc to the copper through the layer of cloth. The copper and zinc plates should be soldered together around the edges, to prevent the acid or exciting liquid from getting between them except where they are separated by the cloth, because the chemical action which would ensue would tend to urge a current in the opposite direction. Soon after constructing the pile Volta made a different arrangement, which he called the *couronne de tasses*, or crown of cups. This was formed of a number of cups, each containing dilute acid or a solution of salt, and a plate of copper and one of zinc, a short distance apart; the copper in one cup being connected by a wire with the zinc plate in the next, instead of lying directly upon or against it. This mode of connection answered the same purpose, allowing electrical polarity to be induced with equal facility when the connecting wires were of sufficient sectional area. When the number of cups, which was indefinite, was completed, the circuit was closed, as was the pile, by connecting the terminal plates with a wire. The cups were joined together in the following manner: Commencing at the positive pole or electrode of the battery, there would be a plate of copper in the first cup, bearing a binding screw at its top, by which it could be connected with a wire; then opposite it, in the same cup, a plate of zinc, connected by a wire or strip of copper with the copper plate in the next cup, and so on; the last plate in the last cup being zinc, connected with a

wire, which latter, when joined to the wire connected with the copper plate in the first cup, closed the circuit. In Volta's cup battery, as well as in the pile, the terminal plates were connected with plates of the opposite metal, a method adopted in accordance with the contact theory; but these additional plates have been discarded as useless. Cruikshank in 1802 modified the form of the pile by using a trough and omitting the separating pieces of cloth, which then became unnecessary. In this battery, which is

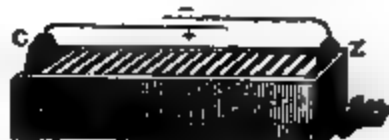


FIG. 3.—Cruikshank's Battery.

represented in fig. 3, a plate of zinc and one of copper are placed together in pairs and held in vertical grooves, all the zinc plates facing in one and all the copper plates in the other direction. The connection between the pairs of plates should be impervious to the fluid in the trough, for the same reason that a similar condition must be observed in the construction of the pile. It is plainly observable that Cruikshank's battery is only a horizontal voltaic pile, possessing but little originality, and not the novelty or convenience of Volta's crown of cups. Useful modifications of it, however, have been made. A common form, sometimes still employed, consists of a wooden trough divided into separate compartments containing the exciting fluid, into each of which are suspended a zinc and a copper or a zinc and a platinum plate, from a horizontal wooden beam, the opposite elements in each compartment being connected together. The beam slides in vertical grooves in posts at the end of the trough; by which means the plates may be raised out of or lowered into the liquid. (See fig. 4.) They may

FIG. 4.—Modern Trough Battery.

also be easily removed from the beam and cleaned or amalgamated with mercury, an operation which it is essential to perform with zinc plates which are not of pure metal; and it not being practical to procure this, the operation of amalgamation is therefore universal. It consists in applying metallic mercury to the cleared surface of the zinc plates, by which the pure zinc becomes dissolved and brought to the surface where the action of the acid is confined. In impure unamalgamated zinc, local polarization takes place, forming local currents which greatly diminish or annul the elec-

tromotive force. A modification devised by Wollaston consisted in having a sheet of copper brought around one end of a zinc plate and separated from it by pieces of cork. Any number of couples can be united by using a trough divided into compartments, or by employing a number of glass or earthen cups such as are represented in fig. 5.

Smee's battery is formed of couples which are the reverse of Wollaston's, there being a middle plate of platinum, or silver covered with finely divided platinum (the latter form increasing the surface and giving an element of strength), with a plate of zinc on each side, not bent, however, around the end of the middle plate as in Wollaston's. It is found that this arrangement is better than to have the positive element in the middle. A powerful form of battery for heating purposes, in

FIG. 5.—Cell of Wollaston's Battery.

consequence of the immense quantity of electricity it generates, was constructed by Prof. Hare of Philadelphia, and consists of one, or only a few simple couples, having a great metallic surface. A large sheet of zinc, of several hundred square feet of surface, and a similar one of copper, are separated by a piece of felt or cloth saturated with acidulated water and then rolled together in the form of a cylinder. (See fig. 6.) On account of its extraordinary heating power, it is called Hare's calorimotor or deflagrator. All these forms of batteries, which employ two metallic elements and one fluid, when used for any considerable length of time, are found to be defective on account of the enfeeblement of the current, which is due to several causes, the principal being: 1, decrease in chemical action in consequence of the gradual separation of the acid by the zinc or positive element, and the accumulation of the salt which is thereby formed; 2, the formation of local currents in the positive plate, in consequence of impurities contained in it, and interfering with the general current; 3, the production of secondary currents which flow in a contrary direction to the general

FIG. 6.—Hare's Calorimotor.

current, and which after a length of time became equal to it, rendering its action null. The nascent hydrogen which is evolved on the surface of the negative plate has a remarkable power, under the circumstances, of decomposing the salt in the fluid. When copper and zinc plates and dilute sulphuric acid are used, for instance, after a time sulphate of zinc, ZnSO_4 , accumulates, and the hydrogen tends to deprive the oxysulphion, SO_4 , of a part of its oxygen, thus loosening its hold upon the zinc constituent, which being attracted by the copper plate is deposited in a metallic state upon it; and this action may continue until the surface of the copper is covered, when of course there will be, in place of the original arrangement of two opposite metals immersed in an exciting liquid, two plates of the same kind, and having therefore little or no electromotive force. Electricians have therefore devised several different forms of batteries with the intention of obviating these difficulties, which, because of their more continuous and equable action, have been called constant batteries. The first of these was constructed by Becquerel, and consisted of a sheet of copper in the form of a cylinder enveloped in a bladder containing a saturated solution of sulphate of copper. The bladder is surrounded by a cylindrical sheet of zinc, and the whole is placed in a vessel containing dilute sulphuric acid or common salt. The battery of Daniell, constructed in 1836, is a modification of Becquerel's in which a porous earthenware cup is substituted for the animal membrane. It is still regarded as the most constant of batteries, although it is not the most powerful. Fig. 7 represents one cell of a Daniell's battery. A glass jar contains dilute sulphuric acid, in which is placed a zinc plate cast in the form of a cylinder; within this is a porous earthenware cylindrical cup; and within this, again, a copper plate in the form also of a cylinder. The porous cell contains a saturated solution of sulphate of copper, and crystals of this salt are placed in the liquid upon shelves, or in a copper-wire basket. Sulphuric acid permeates all the cells, but the porous partition offers a great hindrance to the transfusion of the saline solutions. The nascent hydrogen which is evolved at the surface of the copper plate decomposes the sulphate of copper in the same way that it does the sulphate of zinc in the ordinary zinc and copper couple. The action of a Daniell's battery may be explained as follows: In the diagram a zinc and a copper

plate are represented, having a porous earthenware partition between them; solution of sulphate of copper (Cu_2SO_4) being the active fluid in the presence of the copper, and sulphuric acid (H_2SO_4) the active fluid in the presence of the zinc plate. The polarization of the molecules in both fluids which is effected by connecting the terminal plate with a wire is represented in the following diagram:



An interchange of particles follows this polarization, the terminal negative constituent, SO_4 , going to the positive or zinc plate and combining with it, and the terminal positive constituent (its electrical state heightened by induction) going to the negative or copper plate, and being deposited upon it. It will be observed that the action here is somewhat different from that which obtains in a simple cell containing dilute sulphuric acid as the exciting liquid. In that case hydrogen is liberated at the surface of the copper plate, while in the Daniell's cell it is substituted by metallic copper. The hydrogen constituent of sulphuric acid is separated from it at the porous cell, but is immediately reunited to the salt radical, oxysulphion, SO_4 , the electro-negative constituent of the sulphate of copper. An interchange of molecules is thus effected throughout the whole chain of particles of sulphate of copper and of sulphuric acid lying between the copper and zinc plates; a copper molecule, charged with positive electricity, being at one end deposited upon the copper plate, which within the fluid is charged with negative electricity, and a molecule of the salt radical, SO_4 , charged with negative electricity, uniting at the other end with the zinc plate, which within the fluid is charged with positive electricity. If the molecules of copper after they are deposited could retain their electro-positive condition, a state of polarization of the plate would result similar to that which takes place from the deposition of a film of hydrogen in the ordinary sulphuric acid battery, and having the effect of a deposit of metallic zinc; but as soon as the deposition takes place the polarity of the deposited molecule changes from positive to negative, a necessary result of its becoming a part of the copper plate. When the solution of sulphate of copper becomes dilute, hydrogen is liberated upon the surface of the copper plate, from decomposition of water or of sulphuric acid, it has not been determined which. To preserve the constancy of the battery, it is therefore necessary to keep the solution of sulphate of copper saturated. The sulphuric acid resulting from the decomposition of the sulphate of copper tends to replenish the loss sustained by the formation of sulphate of zinc, but the accumulation of the latter salt weakens its action, so that it is necessary from time to time to add

FIG. 7.—Cell of Daniell's Battery.

fresh quantities of acid. Two ways have been devised to remedy this difficulty, one of which is using a siphon connected with the bottom of the cell, by which the strong solution of sulphate of zinc which settles may be discharged when fresh quantities of sulphuric acid

saturated solution of common salt poured into the outer compartment, which is occupied by the zinc plate. The chemical action when these solutions are used is rather more complex than that which has been given for other fluids. The action of the sulphuric acid on the bichromate of potash produces sulphate of potash and chromic acid. Hydrogen is evolved, and acting upon the chromic acid reduces it to chromic oxide, water being at the same time formed, while the chromic oxide combines with sulphuric acid, forming sulphate of chromium. The electromotive force resulting from these reactions is very great, and the batteries in which these fluids are used are now generally preferred where compactness is desired. Laclanche's battery consists of a carbon electrode packed in a mixture of peroxide of manganese and carbon or coke in coarse powder in a porous cell, and outside of this a cup containing a zinc electrode immersed in a solution of sal ammoniac. Its electromotive force is about nine tenths of that of Daniell's. The comparative values of the electromotive forces of several forms of batteries are as follows: Bunsen's, 839; Grove's, 829; Daniell's, 470; Smee's, 210; Wollaston's, 208.—*Electricity developed by the Action of Solutions upon one another.* If two vessels, one containing a solution of potash and the other of nitric acid, are connected by a bundle of asbestos, as represented in fig.

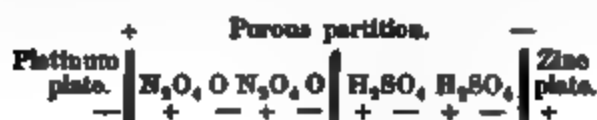


FIG. 9.

9, and two platinum plates are connected with the wires of a galvanometer, a galvanic current will pass through the latter instrument from the acid to the alkali. Davy supposed that this effect was due to the difference in action of the two liquids upon the platinum; but if two cups, each containing a solution of the same salt, as nitre, are placed one on either side of the first named cup, and connected with them by bundles of asbestos, and the platinum slips connected with the galvanometer are placed in the solution of nitre, a current will be produced flowing in the same direction as in the first instance, but it will be weaker, because of the increased resistance offered by the additional liquid. The action of one acid upon another will also generate galvanic currents. Let strong nitric acid be placed in one branch of a U tube, and strong sulphuric acid be carefully introduced into the other so as not to mix (for which purpose a dividing membrane may be used), and platinum strips connected with the wires of a galvanometer be placed one in either branch; a current will thus be generated, passing from the sulphuric acid through the galvanometer to the nitric acid. Fig. 10 represents a galvanic couple composed of two liquids and one metal, devised by Becquerel, and called an oxygen circuit. A bottle, *d*, contains nitric acid, and into its mouth is inserted a tube containing a solution of caustic

FIG. 8.—Cell of Grove's Battery.

are poured in. The other method, devised by Buff, consists in an arrangement by which the zinc plate is gradually made to sink in the fluid at a rate sufficient to counterbalance the loss sustained by diminished chemical action. Grove's battery is a modification of Daniell's, in which nitric acid takes the place of sulphate of copper, and a plate of platinum that of copper. Fig. 8 represents a cell of Grove's battery. A glass or earthen vessel, *A*, containing dilute sulphuric acid, receives a cylinder of zinc, within which is a porous earthenware cup, *V*, containing strong nitric acid, and in which there is immersed a platinum plate, *P*. A cover attached to it confines the fumes of hyponitric acid, N_2O_4 , which are liberated by the decomposing nitric acid, N_2O_5 . The chemical action is shown in the following diagram:



Bunsen's battery is a modification of Grove's, which was devised by Bunsen, then professor of chemistry at Marburg, in 1848. The platinum element is replaced by carbon, which is an excellent conductor, and more electro-negative than platinum. The graphite carbon taken from the retorts of gas works is often used; or a cake may be formed by calcining in an iron mould a mixture of coke and bituminous coal. The electrolytic fluids may be the same as in Grove's; but others are often used, as bichromate of potash, sulphuric acid, and common salt. A battery may be charged with these fluids in the following manner: Two ounces of bichromate of potash are dissolved in 20 ounces of hot water, and when cold 10 ounces of sulphuric acid are added. When the heat caused by the addition of the acid has subsided, the solution is placed within the porous cup, and a

potash, and having a cork in the top through which passes a wire. The bottom of the tube is stopped by a piece of linen cloth, which is covered with clay, and this with cotton wool, to prevent the clay from mixing with the liquid. The wire connects two plates of platinum, α and p , and the connection may be made through the coil of a galvanometer if it is desired to measure the strength of the current. The two liquids meet each other in the clay, and a current of considerable strength is generated, which passes through the wire from the acid to the potash solution, and through the clay from the potash solution to the acid; the latter answering to the copper, and the potash solution to the zinc plate of an ordinary couple.

FIG. 10.
Bequerel's
Oxygen Circuit.

The water in the potash solution is decomposed, its oxygen escaping in bubbles, and its hydrogen going to the nitric acid, which it reduces to nitrous acid. The current which is generated is of constant strength, and the plates do not become polarized. The power is increased by making the plate in the potash solution of amalgamated zinc, which being attacked by the nascent oxygen produces polarization in the direction of the current. A simple couple of this kind is sufficient to effect the electrolysis of water, and several couples form a powerful battery.—*Dry Piles.* A modification of the voltaic pile was made by Deluc in 1809, and improved by Zamboni in 1812, which is remarkable for generating electricity of very high tension, approaching in character that of the frictional machine. The dry pile of Zamboni is made by covering a sheet of porous paper on one side with tin foil, and on the other with a paste made of powdered peroxide of manganese mixed with moistened gelatine, starch, or British gum. When the paste is dry the paper is cut into circular disks about an inch in diameter. These are placed one above the other in a glass tube, the tin-foil faces all turned one way, and the peroxide of manganese ones the other, so that one end terminates in tin foil and the other in manganese. Several hundred or thousand of these couples may be formed into a pile. They should be sufficiently pressed together to effect good contact, each end being fastened by a metallic cap, and one end provided with a knob, the other standing upon a metallic plate. The peroxide of manganese end shows positive, and the tin end negative electricity. Within the pile, therefore, tin corresponds to zinc, and peroxide of manganese to copper, in the ordinary pile or battery. It must not be supposed that the pile will act if it is perfectly dry; it requires, and under ordinary circum-

stances possesses, a certain degree of moisture. It does not produce a continuous current, but after being discharged requires a certain time for the electricity to acquire sufficient tension to pass through the paper from the tin to the peroxide of manganese. A pile of several thousand disks causes strong divergence of the leaves of the electroscope and will decompose water. Its principal use is in the construction of Bohnenberger's electroscope, represented in fig. 11. Two piles stand with their opposite poles upon a metal plate, and from the top of a bell glass which covers the piles a strip of gold leaf is suspended from a conductor which passes through the top and terminates in a knob. The gold leaf hangs between the two knobs of the piles, and the instrument is so delicate that whenever a body only slightly electrified is brought within a few feet of it, the gold leaf will move toward one or the other of the piles. A pith ball suspended by a silk thread between them will oscillate as long as the chemical action of the pile continues, which may be for two or three years.

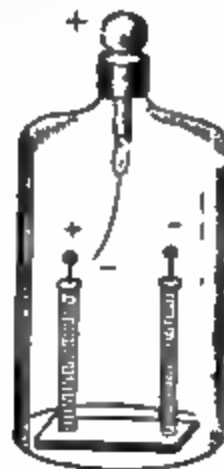


FIG. 11
Bohnenberger's
Electroscope.

stances possesses, a certain degree of moisture. It does not produce a continuous current, but after being discharged requires a certain time for the electricity to acquire sufficient tension to pass through the paper from the tin to the peroxide of manganese. A pile of several thousand disks causes strong divergence of the leaves of the electroscope and will decompose water. Its principal use is in the construction of Bohnenberger's electroscope, represented in fig. 11. Two piles stand with their opposite poles upon a metal plate, and from the top of a bell glass which covers the piles a strip of gold leaf is suspended from a conductor which passes through the top and terminates in a knob. The gold leaf hangs between the two knobs of the piles, and the instrument is so delicate that whenever a body only slightly electrified is brought within a few feet of it, the gold leaf will move toward one or the other of the piles. A pith ball suspended by a silk thread between them will oscillate as long as the chemical action of the pile continues, which may be for two or three years.—*Galvanometers.* It has been stated that if a magnetic needle is brought near a wire through which a galvanic current is passing, it will be deflected; the direction depending upon the relative position of the wire to the needle, and upon the direction of the current. Upon this peculiar action depends the construction of an instrument which is used for measuring the strength of a galvanic current, called a galvanometer. If the wire is held above the magnetic needle, and parallel to it, and a current is passed in the direction of its north end, that end will be deflected to the left, as represented in fig. 12, when the observer is looking downward and to the north. If the wire is held under the needle, and the current passed in the same direction, the north end will be deflected to the right; but if the current is passed from north to south, the needle will be deflected in the same direction as when the current passed above it from south to north. If, therefore, the wire is turned upon itself, as represented in fig. 13, two forces will act upon the needle, tending to deflect it in the same direction; and if the wire is formed into a flat coil, the deflect-



FIG. 12.

represented in fig. 12, when the observer is looking downward and to the north. If the wire is held under the needle, and the current passed in the same direction, the north end will be deflected to the right; but if the current is passed from north to south, the needle will be deflected in the same direction as when the current passed above it from south to north. If, therefore, the wire is turned upon itself, as represented in fig. 13, two forces will act upon the needle, tending to deflect it in the same direction; and if the wire is formed into a flat coil, the deflect-

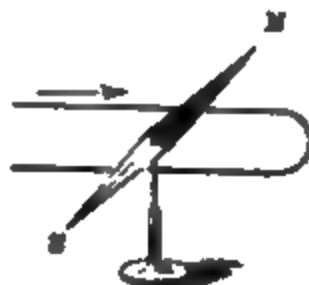


FIG. 13.

ing force exerted upon the needle will be multiplied nearly as many times as the wire passes backward and forward. Schweigger's multiplier, constructed in this manner, is shown in

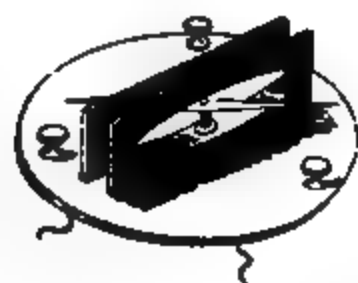


FIG. 14.
Schweigger's Multiplier.

fig. 14. The sensitiveness of the instrument is increased by using what is called an astatic needle, which is constructed by placing two magnetic needles upon the same axis, but with their north and south ends in opposite directions, and suspending them horizontally by a delicate fibre of silk. If their axes are perfectly parallel, and they have precisely the same magnetic force, they will form a system which is astatic; that is, they will when acted upon only by the earth's magnetism point indifferently in any direction. It is however impossible to place them perfectly

FIG. 15.—Astatic Galvanometer.

parallel, and it therefore follows that when they have equal magnetic force they will only come to rest when at right angles to the plane of the magnetic meridian. It is usual, however, except in the most delicate tests, to have one of the needles slightly stronger than the other, so that there shall be a slight directive tendency north and south to the system. If a wire carrying a current is held between the two needles, they will both be deflected in the same direction; and if the wire is formed into a coil, the force will be multiplied. An astatic galvanometer is represented in fig. 15.—*Resistance to Current.* Every galvanic circuit offers a certain resistance to the passage of a current, both in the wires connecting the terminal plates, and in the fluids in the cells. From Ohm's law there may be deduced many of the conditions upon which the strength of the galvanic current and the resistance offered to it depend. The primary force by which a galvanic cur-

rent is set in motion is called the electromotive force, and this, upon the chemical theory, resides principally at the surface of the positive metal, and is generated by the chemical combination which takes place there. The quantity of current which is developed in a voltaic circuit depends upon the electromotive force and the resistance which it has to overcome in passing through the conductors, both solid and liquid, which are contained in the circuit. Ohm's law may be stated as follows: The strength of a galvanic current is equal to the electromotive force divided by the resistance, and is expressed by the equation $C = \frac{E}{R}$, where

C represents the strength of the current, E the electromotive force, and R the resistance. In an ordinary couple there are two resistances offered to the current: 1, that of the liquid conductor between the plates, called the internal or essential resistance; and 2, that offered by the conductor connecting the two plates outside of the liquid. This conductor may consist of one or of several materials; as a wire, or two or more wires having their ends placed in one or more liquids. The resistance offered by such external conductors is called the external or non-essential resistance. The strength of the current produced by increasing the size and number of the plates of a battery may be found by using the equation given above. Let the internal resistance be represented by e , and the external resistance by t ; then in one couple $C = \frac{E}{e + t}$. Let n represent the number

of couples in a battery; then $C = \frac{nE}{ne + t} = \frac{E}{e + \frac{t}{n}}$

which expression, if t is very small, as when the connection between the terminal plates is made by a short, thick copper wire, has very nearly the same value as $\frac{E}{e + t}$; that is, the

strength of the current is not sensibly increased by increasing the number of couples when the circuit is closed by a good conductor. But if the external resistance is very great, as when the current passes through a long telegraph wire, or through a liquid, its strength will be increased by increasing the number of couples. If the size of the plates is increased, then, according to the chemical theory, the electromotive force will be increased, and therefore the strength of the current, provided the conductors do not oppose too much resistance. According to the contact theory, increasing the size of the plates, and therefore the section of the liquid conductor between them, proportionately diminishes the internal resistance. If, therefore, the size of the plates

is increased m times, $C = \frac{E}{e + t} = \frac{mE}{e + mt}$. If

the value of t is very small, the latter expression has nearly the same value as $\frac{mE}{e + t}$, or the

strength of the current then increases very nearly in proportion to the increase in the size of the plates; but if the external resistance is great, the strength of the current will not be increased in proportion to the increase in the size of the plates. Hence, in magnetizing soft iron by passing a current around it through a coil of stout wire, it will be of advantage to use a small number of large couples; but in

FIG. 16.—Coupling for Intensity.

passing a current through a long wire or an electrolyte, or any poor conductor, a large number of couples is to be preferred. The coupling to overcome external resistance is represented in fig. 16, which is the arrangement adopted in telegraph batteries and in galvanoplastic operations, and is called coupling in series. Coupling for quantity, or, as it is sometimes called, coupling in multiple arc, is represented in fig. 17, where plates of the same metal are grouped together. It has the same effect as the employment of one pair of plates having an equal area of surface; increasing the sectional area of the internal or fluid conductor, and correspondingly diminishing the internal resistance; also increasing the quantity of current through the external conductors when they are of sufficient capacity, or when they offer enough resistance, of generating an equivalent quantity of heat. The tension of galvanic is far less than that of frictional electricity, but by greatly multiplying the number of pairs in a battery the tension of frictional electricity

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FIG. 17.—Coupling for Quantity.

may be approached. Thus, a battery constructed by Mr. Gassiot of 8,520 zinc and copper pairs, having electrodes $\frac{1}{8}$ of an inch apart, gave a series of sparks across the interval which lasted for several months. It is usual to say that the quantity of frictional electricity is small and its tension great, while the quantity of a galvanic pair is great in proportion to its tension. An experiment of Faraday's showed

that two wires, one of zinc and one of platinum, each $\frac{1}{8}$ of an inch in diameter, immersed in acidulated water $\frac{1}{2}$ of a second, had a greater effect on a magnetic needle than that of 28 turns of the large electrical machine of the royal institution. The physiological effects of galvanic electricity vary with intensity and quantity; they are treated in the article MEDICAL ELECTRICITY. The astatic galvanometer cannot be used to measure currents of much strength, on account of its too great delicacy. For this purpose the tangent galvanometer and the sine galvanometer are employed. The tangent galvanometer consists of a vertical circle made of a band of copper the two ends of which are connected with the poles of a battery. In the centre of this vertical circle a small magnetic needle is placed, in length about $\frac{1}{4}$ of the diameter of the circle. When the needle is no longer than this, the tangent of the angle of deflection will be proportional to the strength of the current. In using the instrument the plane of the verti-



FIG. 18.—Tangent Galvanometer.

cal circle is placed in the plane of the magnetic meridian. The sine galvanometer, invented by Pouillet, is represented in fig. 19. A longer magnetic needle may be employed in this in-

FIG. 19.—Sine Galvanometer.

cal circle is placed in the plane of the magnetic meridian. The sine galvanometer, invented by Pouillet, is represented in fig. 19. A longer magnetic needle may be employed in this in-

strument, because it is kept at right angles to the axis of the coil through which the current passes. A horizontal, graduated circle, containing a declination needle, is fixed within a vertical circle, the two turning on a vertical axis which passes through the centre of a lower stationary, horizontal, graduated circle, an index being used to measure the arc of revolution. A stout copper wire, covered with silk, is passed one or more times around the rim of the vertical circle, according to the strength of the current which is to be measured. For weaker currents the coils are increased. In using the instrument the plane of the vertical circle is placed in the plane of the magnetic meridian. The needle and index will then each stand at 0, respectively on the upper and lower horizontal circles. If a current is now sent through the wire, the needle will be deflected; and if the vertical circle is rotated till the needle lies in its plane, and therefore again points to 0, the deflection will be marked by the index on the lower circle. The deflecting force of a current acting at right angles to the axis of the needle

exactly balances the magnetic force of the earth, which is proportional to the sine of the angle which the needle makes with the magnetic meridian. An instrument called a differential galvanometer is sometimes used to measure at the same time the difference in strength of two currents. For this purpose two separate coils of the same sized wire are passed an equal number of times around the same needle. When two currents are sent in contrary directions through the coils, the amount of deflection produced will indicate the difference in strength between them. Sir William Thomson's mirror galvanometer (fig. 20) measures a delicate galvanic current with more precision than any other instrument that has been invented. A magnet is suspended within a coil of wire which varies in size and length according to the size and length of the conductor through which the current has already passed. If it has passed through long circuits containing bad conductors, the coil should be long and of fine wire, because the current will have been so much weakened that a fine long wire is now



FIG. 20.—Sir William Thomson's Mirror Galvanometer.

sufficient to conduct it, and therefore it may be used to induce a considerable magnetic force. The coil is placed within the cylinder mounted upon the rectangular box shown in the figure, and to one side of the magnet suspended within it there is attached a mirror which reflects a ray of light upon a horizontal graduated screen in front of it, and behind which there is placed a lamp which sends a ray of light through an orifice. A slight deflection of the magnet, which together with the mirror weighs only a few grains, gives the reflected ray a wide range over the graduated screen. A bar magnet, S, placed in the magnetic meridian, is used to counteract the earth's magnetism and thereby increase the delicacy of the instrument. Another bar magnet, T, perpendicular to the magnetic meridian, is used to adjust the instrument to zero when no current is passing. An instrument called a rheostat, invented by Wheatstone for the purpose of comparing resistances, is represented in fig. 21. Two cylinders of equal diameters turning upon their axes are held in a frame. One of them, A, is of

metal, and the other, B, of some non-conductor, as vulcanite or baked wood. There is a spiral groove in the non-conducting cylinder in which a wire, connected with the binding screw C, is wound for an indefinite distance,



FIG. 21.—Rheostat.

and then transferred to the other cylinder and wound upon it to its further end. By turning the crank connected with one of the cylinders the wire may be all transferred from one to

the other. A binding screw connects with the metal cylinder, and when this and the other binding screw are connected with the electrodes of a battery a galvanic current will pass through the wire which is wound upon the non-conductor, and also through the metal cylinder, so that it will be easy to interpose in the circuit any desired length of wire having any desired area of cross section. Establishing a certain length of a certain sized wire as a unit of measure, a comparison may be made between the resistances of various media. To measure the resistance of any conductor, the rheostat and sine galvanometer may be used in the following manner: In fig. 22, let *m* be a conductor whose resistance is to be measured or compared. One end of it is dipped in a cup of mercury, *b*, which is also connected with one pole of a battery, *T*. The other end of *m* dips into a second cup of mercury, *a*, which is connected with one of the binding screws of the rheostat. A wire attached to the other binding screw is connected with one end of the wire which passes around the vertical circle of the galvanometer, the other end of which connects with the other pole of the battery. The rheostat wire is all wound on the metal cylinder, and the circuit being closed, the deflection of the galvanometer

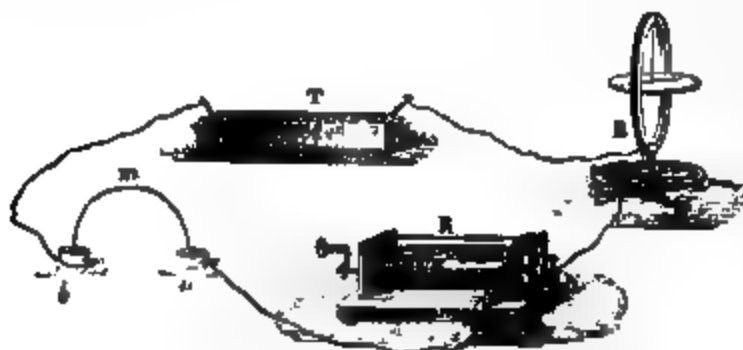


FIG. 22.

may be noted. Then the conductor *m* is removed from the circuit, and the two wires at *a* and *b* are joined. Enough of the rheostat wire is now wound on the non-conducting cylinder to cause the same deflection in the needle as before. That portion of the rheostat wire through which the current passes will have the same resistance as that of the conductor *m*, whose amount is therefore found by comparison. The results obtained from numerous experiments upon the conductivities of various metals show that silver, gold, and copper are the three best conductors, and that impurities greatly increase resistance, as will also an increase of temperature. It has been shown by Forbes that metals have proportional conductivities for heat and for electricity, and that impurities also proportionately increase the resistance for each. The following table gives E. Becquerel's determinations of specific electrical resistances at 15° C., regarding that of silver at 0° as 100:

Silver	107	Tin	734
Copper	112	Iron	825
Gold	155	Lead	1218
Cadmium	407	Platinum	1243
Zinc	414	Mercury	5550

By comparing this table with that of the heat-conducting powers of the same metals in the article HEAT, it will be seen that the numbers which here indicate electrical resistances are inversely proportional to those in that table

which indicate heat conductivities. The resistance offered by liquids to the passage of a galvanic current can be determined with the rheostat and galvanometer in a manner similar to that for solid conductors. Plates of metal at *A* and *B*, fig. 23, are placed one above another in a vertical cylindrical vessel and connected by wires, one with a pole of a battery, and the other with the rheostat, the galvanometer being introduced as before. The terminal plates must be of metal whose relations to the fluid will not excite any electromotive force. The best liquid

FIG. 23.

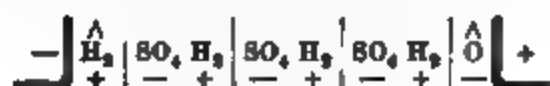
conductors except mercury offer vastly greater resistance than metals. The resistance offered by dilute sulphuric acid is about 1,000,000 times that of silver, and that of water many times greater. If the strength of a series of currents passing through a wire, as measured by the tangent or the sine galvanometer, is represented by the numbers 1, 2, 3, the quantity of heat developed in the same time will be expressed by the numbers 1, 4, 9; therefore the heat generated by a galvanic current is proportional to the square of the strength of the current. With an equal strength of current the heat generated is in proportion to the external resistance. If currents of equal strength are passed through silver and platinum wires of the same length and thickness, the latter will be heated ten times as much as the former, because the resistance offered by platinum is ten times as great as that offered by silver; but it will require more electromotive force to send the current through the platinum.—*Electrolysis.* The decomposition of substances by the galvanic current when there is no consumption of either electrode, as in the cases we have been considering, is called electrolysis, although it differs but little from the decomposition which takes place in the cell of a battery couple, the decomposed fluid in either case being, strictly speaking, an electrolyte. The first decomposition of substances by passing through them currents from the electrodes of a battery was effected by Nicholson and Carlisle, who decomposed water in the year 1800, soon after the construction of the voltaic pile. The electrolysis of water is commonly performed with Faraday's voltameter, a modification of which is shown in fig. 24. Two platinum electrodes, *p* and *n*, pass through sealed orifices in the bottom of a shallow vessel, and over them are placed inverted test tubes, *O* and *H*,

which are filled with water acidulated with sulphuric acid, the same fluid being contained in the shallow vessel. The electrodes are placed as near together as practicable, in order to reduce the resistance. The electrolysis of



FIG. 24.—Voltmeter.

pure water is difficult, and it is doubtful if it occurs in the presence of sulphuric acid, except at the surface of the positive electrode, it being more probable that the chain of molecules of sulphuric acid lying between the electrodes have their elements displaced and re-joined in the following manner:



Other binary compounds are very readily decomposed by electrolysis, as for instance iodide of potassium, KI, in this manner,



the negative element of the compound molecule, iodine, going to the positive, and the positive element, potassium, going to the negative electrode. By means of a battery of 250 couples Sir Humphry Davy decomposed the alkalies potash and soda, showing them to be oxides of two hitherto unknown metals, potassium and sodium. The electrolysis of potash may be accomplished by placing a globule of mercury in a cavity made in a piece of caustic potash, which being moistened lies upon a piece of platinum foil. The latter is connected with the positive electrode of a Grove's or Bunsen's battery of six or seven cells, and the point of a wire, connected with the negative electrode, is placed in the mercury globule, which then attracts the positive element, metallic potassium, of the caustic potash, while the negative element, oxygen, is attracted by the plate of platinum. The potassium on being liberated forms with the mercury an amalgam, which on being subjected to distillation yields metallic potassium. Any substance which is separated into component parts by electrolysis is called an electrolyte, and must be in a fluid condition so as to admit of displacement of the molecules. Although it is believed at the present time that the molecules of solid bodies do not touch each other, still it must of necessity be a condition

that they are held by their polarity in such fixed relations that no external force is sufficient to release them until the attraction is diminished by heat or by some solvent. From the nature of molecular combination, one constituent of a molecule is electro-positive, and the other electro-negative; therefore, when subjected to the influence of electrical attraction, one of the constituents will be drawn to the positive and the other to the negative electrode of the battery. The positive electrode of a battery was named by Faraday the anode, and the negative the cathode, the former referring to the upward and the latter to the downward direction of the current. The elements or constituents of the electrolyte be called ions, the one going to the anode the anion, and the one going to the cathode the cation. Potassium, which is the most electro-positive of all bodies, is therefore always a cation, and oxygen, the most electro-negative body, is always an anion. As a general rule, the metals, or those constituents which contain them, are cations, while the non-metallic constituents are anions; but some elements may be sometimes cations and sometimes anions. In chloride of sodium, NaCl , for instance, chlorine is an anion, while in chloric acid, Cl_2O_3 , it becomes a cation, or electro-positive element. In the electrolysis of ternary salts, which were formerly supposed to be constituted by the union of an acid with an oxide of a metal, it was held that there was a separation of this oxide from the acid, and then a subsequent separation of the oxygen and the metal, and their appearance respectively at the positive and negative electrodes; but this theory was only adapted to the one entertained with regard to the constitution of a salt. It is now held that ternary salts have in reality a binary constitution, the metal forming the electro-positive, and the salt radical the electro-negative constituent. The electrolysis of a salt may be shown by using a U-shaped tube as represented in fig. 25. A solution of the salt colored with sirup of violets is introduced into the tube, and the plati-



Fig. 28.

num electrodes of a battery are placed one in each leg. After the current has passed for a time the fluid will have a red color about the positive, and a green color about the negative electrode, the red being caused by the action

of the acid, and the green by that of the alkali, these bodies being formed subsequently to the electrolytic decomposition of the salt by the union of the metal with the oxygen of the water, and the union of the body SO_2 with the hydrogen. It was the appearance of these acids and bases at the electrodes which led to the old theory of saline compounds. In electrolysis there is not merely a separation and recombination of constituents in the chain of molecules between the electrodes, but there is an actual passage of one to the positive and of the other to the negative electrode. This action was demonstrated by Davy in the following manner: A solution of sulphate of soda was placed in two vessels and connected by a bundle of asbestos moistened with the same solution. The electrodes of a battery being placed in the cups, it was after a time found that the cup connected with the positive electrode contained all the sulphuric acid, while the soda was all found in the other. If one of the cups contains a solution of sulphate of soda, and the other a solution of chloride of sodium or of potassium, both metallic bases will after a time be found in the cup connected with the negative electrode, and the acid radicals in the other; and this transference of molecules will take place with any number of solutions, and through any number of cups which will not offer too great resistance to the passage of the current, provided that all the compounds which are formed by the interchange of molecules are soluble. If, however, an insoluble compound is formed by the union of any of the constituents in any of the vessels, it will be precipitated and thus finally



Fig. 26.

eliminated from the solution. Thus if a solution of sulphate of potash is placed in A, fig. 26, connected with the negative electrode of a battery, distilled water in C, connected with the positive electrode, and a solution of caustic baryta in B, all being connected by threads of moistened asbestos, the passage of a current will effect no transference of sulphuric acid to the positive electrode, but a precipitate of sulphate of baryta will be formed in the cup B. The researches of Faraday have established the following laws of electrolysis: 1. Electrolysis cannot take place unless the electrolyte is a conductor. Water cannot be decomposed when in a state of ice, and other substances, as oxide of lead and chloride of silver, require for electrolysis to be fused to give them conducting power. 2. The energy of electrolytic action is the same in all parts of the current. 3. The same quantity of electricity decomposes chemically equivalent quantities of all the electrolytic constituents through which it passes. That is to say, the same current will in the same time decompose 165 parts of iodide of potassium, 101 of nitrate of potash, 59 of

chloride of sodium, and 9 of water. The decomposition which takes place in electrolysis creates a resistance to the current, and tends to generate a current in an opposite direction, the action being similar to what would be the case if one of the cells of the battery were to be reversed, so that the current would be forced to pass through the liquid from the copper to the zinc. This is in agreement with the doctrine of conservation of forces. A certain amount of the power generated by the consumption of the positive element of the battery, that is to say, by the combination of the acid with the zinc, may be expended in one way or another in the conductors which are traversed by the current. A certain amount of decomposition or electrolysis may be effected in one part, a certain amount of heat in another, and a certain quantity of mechanical power in another; the sum of all the forces expended being precisely equal to the original electromotive force.—*Polarization of Electrodes.* After protracted electrolysis, if the electrodes are disconnected from the battery and placed in a conducting liquid and connected externally by a wire, a current will flow in a direction opposite to that which was generated by the battery. Suppose, for instance,

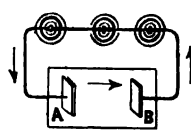


Fig. 27.

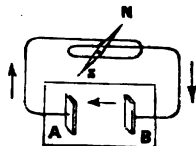


Fig. 28.

that in fig. 27 a battery decomposes sulphate of soda by a current passing in the liquid from A to B. If after a time the battery is removed and the wires attached to the electrodes are connected and coiled around a magnetic needle as shown in fig. 28, it will be found that the current is now flowing in the liquid from B to A, or in a direction opposite to that urged by the battery. The action may be explained as follows: During electrolysis potash collects on the electrode B, and sulphuric acid on A. The battery being removed and a connecting wire substituted, the acid and alkali tend to unite and produce an electromotive force in an opposite direction. In the electrolysis of water, or any body which causes oxygen to be evolved at one electrode and hydrogen at the other, a thin film of gas becomes attached to either plate, having sufficient electromotive force to send a current in the contrary direction when the battery is removed and a connecting wire introduced. Such currents, produced by polarized plates, are called secondary currents; and upon this principle Prof. Grove constructed a gas battery which is capable of producing a continuous current. Two glass tubes (fig. 29), closed at the top and each containing a strip of platinum of the length of the tube having a surface of finely divided plati-

num, which is suspended by a platinum wire passing through the top of the tube, which is closely sealed, are filled with dilute sulphuric acid, and their lower ends, which are

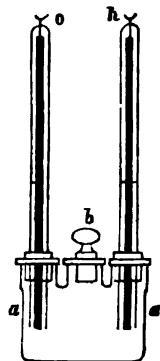


FIG. 29.—Gas Battery.

open, are placed in the same liquid in the vessel *a a*. The platinum strips are then connected with the poles of a battery, and by electrolysis hydrogen is collected in one tube and oxygen in the other. Upon removing the battery and connecting the platinum strips either through a galvanometer or an easily decomposed electrolyte, as iodide of potassium, a current will flow from the oxygen to the hydrogen tube, and in the opposite direction to that produced by the battery used in evolving the gases, while during the action

the gases in the tubes will gradually disappear, the hydrogen twice as fast as the oxygen. Ritter's secondary pile is constructed upon the same principle. A number of disks of the same metal are separated by pieces of moistened cloth. After passing for a time a galvanic current through the system, on removing the battery and connecting the ends of the pile a current will be found passing in the opposite direction to the battery current.—Prof. Clausius proposes a "molecular theory of electrolysis," which may be briefly stated as follows. An electromotive force urges the constituents of the compound molecules of an electrolyte in opposite directions. The components being joined together in pairs by chemical force, an electrolytic force sufficient to tear them asunder is hardly conceivable, and therefore an additional power is sought for. The molecules of an electrolyte, as of all bodies, are constantly in a state of more or less intense vibration. In electrolytes, which are fluids, the molecules, which exist in pairs, are constantly striking against each other. Sometimes the components of a pair are separated, and it is at this time, according to Clausius, that the electromotive force causes the molecules of one kind to move in one, and those of the other kind in the opposite direction.—The identity of frictional electricity and galvanism is regarded as established, but the expression is rather indefinite when it is considered that at the same time a wide difference in the phenomena is recognized. That the particles of ponderable matter, or of ether, whichever may be the media of electrical action, assume motions of an entirely different character, and which may also be transformed one into another in accordance with the influence of other forces and conditions, is not only probable, but is a view whose acceptance can scarcely be resisted. Moreover, having accepted the doctrine that ethereal heat vibrations are communicated to

ponderable matter, and from ponderable matter again to the ether, it is natural to believe that electrical motion in ether may propagate or generate motion in ponderable matter, which we recognize as another form of electricity. The production of light by the passage of the electric current through a resisting conductor, as a fine metallic wire, is caused, as is generally believed, by a correlation of forces, that is, by the electric force generating heat vibrations in the conductor, which in turn propagate themselves in the ethereal medium, and increasing in rapidity finally produce the phenomenon of light. Although the passage of a galvanic current through a resisting conductor generates heat, the two phenomena differ decidedly in character. The electrical condition is not retained by the wire when it is disconnected with the battery, but the heat which is developed continues for a considerable time. Again, statical electricity resides upon the surfaces of bodies, whereas heat is contained within them and has a tendency to diffuse itself equally. If a hollow vessel is electrified, its interior will exhibit no signs of electrical excitement, but heat will pass with equal facility to the interior or to the exterior.

—*Electrical Potential.* The doctrine of electrical potential has not been discussed here or in the article *ELECTRICITY*, because for its explanation and application more space would be required than the limits of the articles would allow. It was introduced by Green, and has been recently generally adopted in the application of mathematical methods of the discussion of electrical phenomena. The definition given by Jenkin affords, perhaps, as clear an idea of the meaning of the term as may be communicated in a few words: "Difference of potentials is a difference of electrical condition in virtue of which work is done by positive electricity in moving from a point at a higher potential to that of a lower potential, and it is measured by the amount of work done by the unit quantity of positive electricity when thus transferred." Electrical potential is, therefore, a relative quantity, and relates to the difference in electric quantity or electric force between two points or two surfaces. If it has any positive value, it is that given by a difference in electric condition between a given body and the earth, whose potential is usually regarded as constant. This is, however, not strictly so, as must be evident from the fact that earth currents of different intensities must produce different potentials. For an explanation of the doctrine of electrical potential the reader is referred to special treatises on electricity and magnetism, such as those of Clerk Maxwell and Fleeming Jenkin.—*GALVANOPLASTY*, or *ELECTRO-METALLURGY*, is the art of separating metals from their chemical compounds and causing them to be deposited in their elementary condition upon surfaces in various forms by the agency of dynamical electricity. Its principal divisions are electropla-

ting and gilding, and electrotyping. In electroplating and gilding the deposited metal is usually retained upon the surface it is deposited upon, while in electrotyping it is subsequently removed from such surface, which is used as a mould of which the deposit forms a reverse copy.—*Electroplating and Gilding.* Gilding was formerly done by covering the metal to be gilt with an amalgam of gold and mercury and volatilizing the latter metal, and the same process was employed in silvering. Brugnatelli, a pupil of Volta, is said to have been the first, in 1803, to gild the baser metals by means of the galvanic current; but De la Rive was the first to make the process successful. Its present state of perfection, however, is due to Elkington, Ruolz, and others. The processes of electroplating and electrogilding are almost identical, and depend upon the power of inducing an electro-negative condition upon a surface, usually metallic, which causes it to attract the electro-positive or metallic constituent of a salt; and also of inducing an electro-positive condition in a neighboring surface, causing it to attract the electro-negative or non-metallic constituent. The positive plate in a battery, or the one upon which the chemical action takes place, and which is connected with the negative electrode, must therefore be joined by the latter to the plate upon which it is desired to deposit the metal, the other or negative battery plate being connected with the plate in the bath upon which an electro-positive condition is to be induced. The tendency in the bath, as the liquid is called which contains the metallic salt from which by electrolysis the metal is deposited, is usually to create an electromotive force acting in a direction contrary to the battery current; therefore the electromotive force of the latter must be sufficient to overcome the former, and also to effect decomposition. In choosing a bath solution, therefore, it is desirable to take one the tendency of whose action is to create as little opposing electromotive force as possible, and this is usually done by choosing an alkaline instead of an acid solution. It requires a powerful battery to cause a deposit of metallic gold to be formed from a solution of the chloride upon the perfect metallic surface of an iron plate; but by employing a cyanide of the metal dissolved in cyanide of potassium, the deposition is practicable with the use of a small battery or a single couple. If a clean piece of iron is dipped in a solution of sulphate of copper, it becomes coated with a film of the latter metal; but this is not an example of true electroplating, the copper not being deposited upon the clean metallic surface of the iron, but upon a film of the oxide or of the sulphate of that metal which is formed by the action of the sulphuric acid contained in the sulphate of copper. No chemical action must be suffered to take place upon the iron plate; but while in a clean condition it must have negative electricity induced upon it sufficient to cause it, instead of attract-

ing the acid, to attract the metallic constituent of the solution. It is usual in practice, in electro-silvering or gilding iron, to first deposit a thin coating of copper, which is more easily attached to the iron than the more precious metals, and forms a better surface for their deposition. An article of copper, which may be a cast of some object, or a piece of iron or one of the baser metals, after having been first electroplated with copper from a solution of the sulphate or of the cyanide, is plated with silver in the following manner: Cyanide of potassium being carefully added to a solution of nitrate of silver, a precipitate of cyanide of silver, AgCy , is formed, which, being washed in distilled water, is dissolved in a solution of cyanide of potassium, by which there is formed a double salt of cyanide of silver and potassium, AgKCy_2 ; or lime water may be added to the solution of nitrate to precipitate oxide of silver, which may then be dissolved in cyanide of potassium. Another mode of forming the solution is to add a solution of common salt to that of nitrate of silver, and dissolve the chloride in cyanide of potassium. In either case AgKCy_2 is formed. The object to be

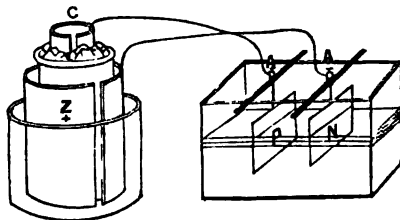
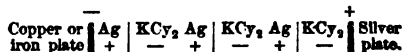


FIG. 30.—Simple Bath.

plated is connected with the negative electrode of a battery or a magneto-electric machine and suspended in a hot solution of the cyanide, and a plate of silver connected with the positive electrode is suspended near it, as represented in fig. 30. The object to be plated, now forming the negative electrode of the electrolyte cell, attracts the metallic silver of the cyanide; the potassium, the most electro-positive of the three bodies, remaining combined with the cyanogen, the two forming the electro-negative constituent of the compound AgKCy_2 . The reactions which take place may be represented in the following diagram:



The body KCy_2 , which is liberated upon the surface of the silver plate, immediately combines with that metal, and thus the solution is continually replenished with the double cyanide. For gilding, a solution of auro-cyanide of gold, AuKCy_2 , corresponding to the silver salt, may be formed in a similar manner. A plate of gold forms the positive, and the object which is to be coated the negative electrode.

A number of objects may be suspended upon one rod, the positive electrode being enlarged so as to offer a sufficient surface for the action of the cyanide of potassium; or the compound cell system may be adopted, as represented in fig. 81, where the bath is divided into separate

FIG. 81.—Compound Bath.

cells, like those of a trough battery, the negative plate in one cell being connected with the positive plate in the next. This arrangement requires the addition of electromotive force to the battery, and is moreover found not to be so manageable or economical as the simple cell system. Electroplating in nickel has recently been introduced by Dr. Isaac Adams of Boston. The following bath has been found to work well: Add one part of a solution of neutral tartrate of ammonia to 20 parts of a solution of the double sulphate of nickel and ammonia, both solutions being in water and standing at 70° Baumé. After mixing and standing a few hours, the bath is ready for use. A plate of nickel forms the positive electrode. Several applications of nickel-plating have been patented; as to gas burners to protect the tips from oxidation; to culinary utensils for the same purpose; to facing printing type, to harden the surface and prevent the action of colored inks; and for covering portions of firearms. It is also used in plating surgical instruments. Electroplating is not confined to the deposition of one metal upon another, but alloys may be coated with one metal, or a single metal may be coated with an alloy. Brass and bronze, with careful management, and by the use of positive electrodes of the alloy, may be successfully deposited upon copper plates.—*Electrotyping*, which consists in making a cast of a metal upon a mould by galvanic action, is performed as follows: The "form" containing the type, woodcut, or other engraving which is to be electrotyped, is cleaned and slightly dusted with finely powdered black lead. It is then laid face upward on a bed plate of a hydraulic or toggle-joint press of great power. A brass case in the form of a shallow pan, and rather larger than the form, has turned into it about a half inch thickness of melted beeswax, which after cooling is placed over the form, and the two are powerfully pressed together. This forms a wax mould, which after being separated from the form is built up, in places which are to be

ing iron; an elevation upon the mould, of course, forming a depression in the electrotype plate. The surface of the mould is now coated over with fine black lead powder, to give it a conducting surface for the galvanic current, which operation is performed with a kind of stippling brush of badger's hair, moved by machinery in a box containing black lead dust. When a good surface has been formed the loose particles are blown off, and it is washed with a weak solution of sulphate of copper, after which it is dusted with fine iron filings, by which means a film of metallic copper is deposited over the black lead surface, which increases its compactness and conducting power. It is then suspended in a bath composed of sulphate of copper and sulphuric acid, in the proportion of two of the salt to one of the acid, in enough water to stand at about 14° Baumé, and is connected with the negative electrode of a battery or of a magneto-electric machine. Opposite the face of the mould there is suspended a sheet of copper, connected with the positive electrode. From its greater constancy Daniell's battery is usually preferred, but others may be used, and where great rapidity is required powerful magneto-electric machines like that of Wilde (see *MAGNETO-ELECTRICITY*) are employed. A series of moulds may be suspended back to back, the copper sheet being placed between opposite pairs. When the circuit is closed the sulphate of copper is decomposed, the metallic copper, the positive constituent, going to the negative plate, which is the plumbago surface of the mould, while the body SO_4 unites with the copper plate, forming sulphate of copper. The arrangement of bath and battery is similar to that shown in fig. 80. The moulds may be made of gutta percha instead of wax. The time required to form the electrotype plate depends upon the strength of the solution and the electromotive force of the battery or magneto-electric machine. With a saturated solution of sulphate of copper, and a machine requiring a six-horse power to drive it, several large plates may be made in less than one hour. After the shell, as the deposit is called, is taken off the mould, it is placed in water to protect it from oxidation until the workmen are ready to perform the operation of backing. A shell is laid upon its face in a shallow vessel having a plane bottom, and its back is washed with a solution of chloride of tin, called soldering fluid. A sheet of tin foil is then laid over it, and heat applied to the bottom of the pan until the foil melts and spreads over the surface. A fusible alloy of tin and zinc or type metal is then melted and turned upon the back to the thickness of about an eighth of an inch. After cooling the plate is taken out, cleaned, and polished with marble dust and benzine, or with clay and soft soap; and it may be faced with nickel if desired.

GALVANIZED IRON, a name given to iron coated with zinc, or zinc and tin. The pro-

cess is a French invention, and was not introduced into England till 1837, when a patent was obtained by Mr. Crawfurd. The operation is not performed with a galvanic battery, as is often supposed, but by immersion in the melted metal. By Mallet's process the sheets are first cleansed by immersion in a warm bath of equal parts of sulphuric or hydrochloric acid and water, followed by scrubbing with emery and sand. They are then placed in a preparing bath of a saturated solution of hydrochlorate of zinc and sulphate of ammonia; and from this they are removed to a metallic bath composed of 202 parts by weight of mercury and 1,292 parts of zinc. To every ton weight of the amalgam one pound of potassium, or better of sodium, is added. At the temperature of 680° F. the compound fuses, and the zinc is deposited upon the iron sheets; the iron at the same time is attacked so strongly, that in a few seconds a plate an eighth of an inch thick would be dissolved if allowed to remain. Small articles are most advantageously treated after the strength of the mixture has been somewhat spent upon larger ones. Crawfurd's method was to plunge the cleansed sheets of iron into a bath of melted zinc covered with sal ammoniac, and stir them about for some time. Undiluted commercial acids are also used for cleaning the surface of the iron, in which case some bits of zinc are immediately added, which dissolves and is directly precipitated, forming a film upon the iron. When coated the articles may be applied to use, or they may be made still more effectually to resist the action of oxidizing agents by next dipping them in a bath of melted tin. This metal then forms the exterior coat, and adheres much more firmly than if it had been applied directly to the iron.

GALVESTON. I. A S. E. county of Texas, including the island of the same name; area, 680 sq. m., of which 274 sq. m. are water; pop. in 1870, 15,290, of whom 3,236 were colored. The main portion of the county occupies the W. shore of Galveston bay, and is separated from the island, lying in the gulf of Mexico, by West bay. N. E. of the island, and separated from it by a channel 1 or 2 m. wide, is Bolivar peninsula, forming a part of the county, and lying between the gulf and East bay, an arm of Galveston bay. The surface is generally level and the soil sandy. The chief productions in 1870 were 2,905 bushels of Indian corn, 16,205 of sweet potatoes, and 213 tons of hay. There were 390 horses, 717 milch cows, 6,140 other cattle, 586 sheep, and 719 swine on farms. The number of manufacturing establishments was 91, employing 538 hands; capital invested, \$710,950; value of products, \$1,214,814. II. A port of entry, seat of justice of the above county, and the chief city of Texas in point of population and commerce, situated at the N. E. extremity of Galveston island, at the mouth of the bay of the same name, the entrance to which is through the

channel between the city and the S. W. point of the peninsula of Bolivar, where a light-house has been erected, 180 m. E. S. E. of Austin, and 290 m. W. by S. of New Orleans; lat. 29° 19' N., lon. 94° 46' W.; pop. in 1850, 4,177; in 1860, 7,807; in 1870, 18,818, of whom 3,007 were colored and 3,614 foreigners. The population at the beginning of 1874 was estimated by the local authorities at from 25,000 to 30,000. The city is laid out with wide and straight streets, bordered by numerous flower gardens. Besides the churches, the public buildings include the custom house, post office, United States court house, county court house, city and county prison, city hall, opera house, 2 theatres, 3 concert halls, 4 other public halls, 13 hotels, and 3 market houses. Oleander park occupies 80 acres, and the city park 25 acres. There are 6 public squares, an esplanade 2 m. long, and 8 public gardens. Magnolia Grove cemetery comprises 100 acres, and the city cemetery 10 acres. There are 9 m. of street railroad in operation. The island is about 28 m. long and from 1½ to 3½ m. wide, intersected by many small bayous, diversified by several fresh-water ponds, and bordered through its whole length by a smooth hard beach, which forms a pleasant drive and promenade. The bay is an irregular indentation, branching out into various arms, and receiving Trinity and San Jacinto rivers and Buffalo bayou. It extends 35 m. N. from the city to the mouth of Trinity river, and has a breadth of from 12 to 18 m. The harbor is the best in the state, and has 13 ft. of water over the bar at low tide. The city is provided with good wharves, and large storehouses adjoining them. The chief business is the shipping of cotton. The southern cotton press company owns 14 brick warehouses, each occupying 2½ acres, and the Texas cotton press company 3 more brick warehouses covering 7½ acres. The receipts and shipments in bales since 1868, for each year ending Sept. 1, have been as follows:

YEARS.	Receipts.	Shipments.	YEARS.	Receipts.	Shipments.
1868	93,682	101,749	1871	204,718	259,023
1869	133,465	133,480	1872	158,073	191,369
1870	229,508	225,215	1873	328,618	323,618

In 1878 170,711 bales were shipped to Great Britain, 6,100 to France, 32,584 to other European countries, 18,630 to New Orleans, 67,038 to New York, 18,756 to Boston, and 14,794 to other coastwise ports. The receipts of hides were 460,854; shipments, 459,582; receipts of wool, 3,873 bags; shipments, 3,760 bags. The value of pine lumber received was \$624,000; cypress, \$480,000; total, \$1,104,000; head of cattle shipped, 50,699. The total value of shipments was \$35,333,747, including cotton to the value of \$32,423,806; of receipts, \$29,811,831. The number of immigrants during the year was 44,614. The value of imports from and exports to foreign countries since 1870, with the amount

of duties collected, for each year ending July 31, is shown in the following table:

YEARS.	Imports.	Exports.	Duties.
1870	\$515,284	\$15,474,629	\$277,750
1871	1,858,208	14,275,621	688,218
1872	1,684,593	11,045,681	671,532
1873	2,460,610	17,894,908	492,429

Of the exports in 1873, \$17,549,096 were the value of cotton. The entrances and clearances for the year ending June 30, 1873, were as follows:

FOREIGN COMMERCE.		COASTWISE TRADE.	
Vessels.	Tons.	Vessels.	Tons.
Entered: 84 American....	16,431	446 steamers.	511,511
113 foreign	57,594	187 sailing ...	55,481
Cleared: 61 American....	81,949	258 steamers.	279,994
113 foreign	63,409	109 sailing....	44,694

The number of vessels belonging to the port was 257, with an aggregate tonnage of 23,462, including 198 sailing vessels of 13,813 tons, 35 steamers of 6,709 tons, and 24 barges of 2,940 tons; built during the year, 10 sailing vessels of 165 tons, and 1 barge of 57 tons. There is a daily line of steamers to New Orleans and another to Indianola and Corpus Christi; a weekly line to Havana, and another to New York; and a semi-monthly line to Liverpool. The Galveston, Houston, and Henderson railroad connects the city with Houston and the diverging railroads, crossing West bay on a bridge nearly 2 m. long. The depot and warehouses cover 20 acres. The Galveston Wharf railroad enables the company to load its cars directly from the vessels. A canal, 10 m. long, opens an avenue for commerce to the Brazos river. The chief manufactories are two iron foundries, six machine shops, and the gas works. The New York and Texas beef-preserving company kill and can 48 cattle per day. There are two national banks, with an aggregate capital of \$800,000; a savings bank, with \$175,000 capital; two banking and insurance companies, and four insurance companies, including a life insurance company. The whole number of joint-stock companies is 23, having an aggregate capital of \$12,211,000. The city is divided into four wards, and is governed by a mayor and a board of 12 aldermen. Water works are in process of construction, and there is an efficient health department. Of streets 17 m. have been shelled, and 26 m. filled and graded. The assessed value of property for the year ending Feb. 28, 1873, was \$16,500,000; bonded debt, \$380,700; estimated receipts for the year ending Feb. 28, 1874, \$282,986; estimated expenditures, \$278,763. The principal charitable institutions are the house of refuge, having grounds 88 acres in extent, an orphan asylum, and three hospitals, one of which is supported by the city. The Roman Catholic university of St. Mary was founded in 1854, and in 1872 had 8 professors and 35

collegiate and 115 preparatory students. The Galveston medical college, founded in 1864, has six professors. The Ursuline convent, containing 25 nuns, has a female academy connected with it, and 120 pupils. There are two other female seminaries, with about 350 pupils. The six public schools in 1872 had 16 teachers and 700 pupils. The whole number of pupils in public and private schools, &c., is about 3,500. The mercantile library contains about 9,000 volumes, and has a reading room. There are 15 churches, and 5 daily (1 German), 2 tri-weekly, 1 semi-weekly, and 6 weekly (1 German) newspapers.—The island of Galveston was occupied by the pirate Lafitte in 1817, and continued to be his headquarters until his settlement was broken up in 1821. The growth of the city dates from 1837. During the civil war it was occupied by the federal forces, Oct. 8, 1862, but was retaken by the confederates, Jan. 1, 1863.

GALVEZ, Bernardo, count de, a Spanish soldier and statesman, born in Malaga in 1758, died in Mexico, Nov. 30, 1786. He was the son of Don Matias de Galvez, his predecessor as viceroy, and nephew of José de Galvez, marquis of Sonora, visitor of Mexico from 1761 to 1769, and subsequently minister general of the Indies. He served in France and in the Algerine expedition, rose to the rank of colonel, and was made governor of Louisiana July 10, 1778. During the American revolution he gave the Americans aid for operations at a distance from Louisiana, on the frontiers of Virginia and Pennsylvania and on the northwest, but did not permit them to operate against any English posts near him. When Spain joined in the war, Galvez in 1779 raised an army and took from the English Fort Manchac, Baton Rouge, and Fort Panmure at Natchez. In March, 1780, he took Mobile, and on March 9, 1781, he appeared before Pensacola with Solano's fleet, bearing an army of 5,000 men, and on May 10 compelled Gen. Campbell to surrender. He was created a count, and in 1784 appointed captain general of Cuba, Louisiana, and the two Floridas; but as his father's death in 1784 left his post vacant, he was made viceroy of Mexico, retaining the captain-generalcy of Louisiana and Florida. He was so regardless of stiff official Spanish dignity that he gave offence in Spain, and his erection of the palace of Chapultepec excited suspicion, and led to such vexations and annoyances that he fell sick and died of chagrin after a brief administration.

GALWAY. L. A maritime county of Connaught, Ireland, bordering on the Atlantic and Galway bay, and on the counties of Mayo, Roscommon, Kings, Tipperary, and Clare; area, 2,342 sq. m.; pop. in 1871, 248,257. It is separated by Lough Corrib into two divisions, differing in geological formation and physical appearance. The eastern division rests on a limestone basis, and is in general level and fertile, except the central parts, which contain large quantities of wet bog, nearly unproductive.

The western part, comprising the district of Connemara, rests upon granite, and is barren, rugged, and mountainous, but contains valuable mines of copper, lead, and manganese, and quarries of marble and other stones. Agriculture is in a very backward state. The southern parts produce some fine wheat, but oats and barley are the principal products elsewhere. Flax is also cultivated, but less extensively than formerly. Grazing is much attended to. The coast fisheries have diminished in importance; but a company has recently been formed for carrying on deep-sea fisheries. There are some manufactures, among which are woollen hosiery, coarse linens and friezes, and felt hats. The production of kelp was formerly one of the great sources of profit on the western shores, and is still carried on to some extent. Celtic cromlechs and Anglo-Norman castles are frequently to be met with. The chief towns are Galway, Tuam, Loughrea, and Ballinasloe. II. A town, seaport, and parliamentary borough, and capital of the county, near the head of Galway bay, 117 m. W. of Dublin, with which it is connected by railway; pop. in 1871, 13,184. The greater portion of the town is built upon a tongue of land, bounded E. by Lough Athalia, an arm of the sea, and W. by the Corrib river. The other and smaller part is on the opposite bank of the river, and is connected with the former by one wooden and two stone bridges. In the old town the streets are narrow, irregular, and dirty, but in the modern part they are in general spacious, handsome, and cleanly. The chief public edifices are the Queen's college, the collegiate church of St. Nicholas, the Franciscan convent, and two handsome court houses. Galway was formerly the principal emporium of Ireland, and for several centuries enjoyed the monopoly of the trade with Spain. It was then surrounded by walls, of which only a few fragments now exist. The principal exports are corn, flour, kelp, marble, wool, and provisions. The chief imports are timber, wine, salt, coal, hemp, tallow, and iron. The harbor has an extensive line of quays, and is connected with Lough Corrib by a canal. It has a floating dock, which admits vessels of 14 ft. draught. On Mutton island, in front of the harbor, is a lighthouse 88 ft. above high water.

GAMA, José Basílio da, a Brazilian poet, born in 1740, died in Lisbon, July 31, 1795. He was brought up as a member of the society of Jesus, but left it, and went to Lisbon and to Rome, where he was for a time professor in a seminary. Owing to his former affiliation with the Jesuits, he was banished after his return to Brazil. At Lisbon he found a protector in Pombal, who after the publication of his poem *L'Uruguay*, describing the overthrow of the Jesuit missions (1769), gave him a place in the state department, and in 1771 he was raised to the nobility. He translated parts of Metastasio and Goldoni, published poems, and became a member of the academy of Lisbon.

GAMA, Vasco da, a Portuguese navigator, born at Sines, died in Cochin, India, Dec. 25, 1524. Bartholomew Dias, a Portuguese explorer, having visited the cape which he called *Cabo Tormentoso*, or Stormy cape, brought back such interesting accounts of his discoveries that the Portuguese sovereign Emanuel determined to urge discovery beyond the point where Dias left it, and if possible to reach by sea the countries of the Indies. Accordingly an expedition was placed under the command of Vasco da Gama, a gentleman of the king's household, and a skilful and experienced mariner. The fleet consisted of the *São Gabriel*, flag ship, of 120 tons, the *São Rafael* of about 100 tons, a caravel of 50 tons, and a store ship, with a total force of 160 men. On July 8, 1497, the expedition departed from Lisbon for the Cape Verd islands, whence it set sail on Aug. 8 southward along the African coast. Delayed by storms, it was not till Nov. 7 that they reached the bay of St. Helena, near the cape. Departing on the 16th, they encountered a succession of tempests such as had gained for the southern promontory of Africa the name of the cape of Storms. The courage of Gama's companions failed, and they besought him to put back, which he not only refused to do, but put the ringleaders of the movement in irons, and held on his course into the stormy sea. When they were beating about off the promontory, Gama fancied that he saw the spirit of the cape. Camoëns has sung this incident as a fact, while moderns, less poetical, say that the apparition could have been nothing more than that peculiar cloud whose sudden envelopment of the cape is the forerunner of a storm. On Nov. 20 (according to Barros, but more probably on the 22d) they doubled the cape of Storms, or, as Emanuel himself had named it ere the expedition set out, the cape of Good Hope. Proceeding along the coast, they touched at various points, among others at Natal. Further N. they discovered Mozambique, and came upon a country which exhibited a high stage of commercial advancement, the inhabitants having regularly built ports, with mosques. The natives were Mohammedans, carrying on a trade in pearls, rubies, silver, linen, and spices with Arabia and India. Gama took with him a pilot from this place. On April 1, 1498, the explorers discovered the island of Acontado, so named by Gama from a flogging he gave his pilot there; and on the 7th the island of Mombassa, where the inhabitants were bravely apparelled in silken stuffs and jewelry. As these men tried to cut his cable, Gama seized a boat containing 17 of them, and carried them off to Melinda, 8° S. of the equator, where the king of the place entered into friendly relations with the Portuguese, and gave them a pilot to conduct them across the Indian gulf. Melinda was described as a regularly built city, with wide streets, and houses of more than one story. The Melindese pilot is supposed to have been acquainted with

the astrolabe, compass, and quadrant. Under his guidance the voyagers steered 750 leagues across the open sea. In 23 days they arrived off the Malabar coast, and on May 20, 1498, they reached Calicut, the object of their search. Their mission was thus accomplished, and a new route to the East established. Gama met with a cordial reception at the court of Samoudri Rajah (abbreviated to Zamorin); but the Arabs at that place, foreseeing that the Portuguese would eventually take the trade with the East out of their hands, instigated Zamorin against them, and Gama narrowly escaped. He immediately set sail on his homeward voyage, calling at Melinda on the way to take on board an ambassador to Emanuel's court, and arriving in the Tagus on Aug. 29, 1499, after an absence of 26 months. He brought back only 55 men and one ship, a caravel which he had chartered at Cape Verd. The San Rafael had been lost on the coast of Africa, the store ship burned according to Gama's instructions, the São Gabriel condemned at Cape Verd, and Nicolão Coelho had slipped away with the remaining vessel, in order to be the first to tell the great news in Portugal. The king received Gama splendidly, and permitted him to bear the title of "lord of the conquest of Ethiopia, Arabia, Persia, and India." Emanuel immediately fitted out a second fleet of 13 ships, with 1,200 men, under the command of Pedro Alvarez Cabral, to establish trading posts. The most remarkable incident of the voyage was the accidental discovery of Brazil. From there Cabral got to India, and established a factory at Calicut; but on the departure of the fleet the inhabitants massacred all the Portuguese who had been left behind. The Portuguese government now sent out a fleet of 20 ships under command of Gama, which sailed early in 1502. On reaching the Indian seas Gama made a treaty with the kings of Sofala and Quiloa, the latter agreeing to pay tribute to Portugal. Determined now to strike terror into the hostile kings of the Indian coast, he seized a large ship containing 800 male and female pilgrims of the highest rank and of various nationalities on their way to Mecca, and killed them all, excepting 20 children, whom he saved to bring up in the Christian faith, as an atonement for one of the Portuguese who had apostatized to Mohammedanism. This affair at once opened to him the port of Cananore, whence he sailed to Calicut, seizing on the way 50 of the natives. Here he demanded the right to trade, with immediate reparation for past indignities, and, not receiving it promptly, he hung his 50 prisoners at the yard arm and burned the town. Thence he proceeded to Cochin, where he entered into friendly relations with the king, and presented him a golden crown from the king of Portugal. The Calicut Zamorin, however, made war on Cochin for his alliance with the strangers. Gama, leaving five ships to cruise on the coast, returned home with 13 ships, having a battle on the way with the Calicut fleet, which he

utterly routed. On his return the king created him admiral of the Indian ocean and count of Vidigueira. For the next 21 years Gama lived in retirement. In 1524, the Portuguese dominion having largely expanded in the East, John III. appointed him viceroy of the Indies. He proceeded to his seat of government, but died at the close of the year. In 1528 his body was brought to Portugal and interred with honor. Barros has published an account of his voyages, and Camoëns celebrates them in his "Lusiad."

GAMALIEL, a Jewish doctor of the law, member of the sanhedrim, and teacher of Saul, the future apostle Paul, died about A. D. 52. In the Talmud he is surnamed Hazzaken, "the Elder," to distinguish him from his grandson, who after the destruction of Jerusalem presided over the sanhedrim at Jamnia. He was grandson of Hillel, the renowned teacher of the Mishnah. He held a seat, and probably the presidency, in the sanhedrim during the reigns of Tiberius, Caligula, and Claudius, being succeeded by his son Simeon. When Peter and the other apostles were brought before the council in Jerusalem (Acts v.), he recommended to "let them alone, for if this counsel or this work be of men, it will come to nought; but if it be of God, ye cannot overthrow it; lest haply ye be found even to fight against God." He was the author of many religious and civil reforms, and remarkable for humanity, charity, and tolerance. He was the first to be distinguished by the title *rabban* (our master). The respect with which his opinions are always quoted by the rabbis is irreconcilable with the tradition that he was converted to Christianity.

GAMBETTA, **Léon**, a French statesman, of Genoese-Jewish descent, born in Cahors, Oct. 30, 1838. He studied law, and became a member of the Paris bar in 1859. In 1863 he acquired eminence as an ultra liberal, in 1868 became still more famous by his denunciations of the arbitrary measures of Louis Napoleon, and in 1869 he was elected deputy by the so-called party of "irreconcilables" for Paris and Marseilles. He meant to take his seat for Marseilles, but was prevented by illness until the beginning of 1870, when he protested in the corps législatif against the imprisonment of his friend and colleague Rochefort (Feb. 7), and shortly after against Louis Napoleon's new plébiscite, which he declared to be a violation of the constitution. On the news of the surrender of Louis Napoleon at Sedan he proposed to depose the imperial dynasty, and was among the first to proclaim the republic, Sept. 4; and on the 5th he became minister of the interior in the provisional government of national defence. He took measures for convoking the electoral colleges; but Paris being invested by the Germans, no election could take place. Early in October he escaped in a balloon to join his colleagues at Tours. Here, and afterward at Bordeaux, he assumed the general direction of movements outside the

capital, taking charge of the interior, war, and finance departments. He made desperate efforts to organize new armies, issuing unfounded reports of victories, and understating the importance of the defeats, which he generally ascribed to treason, especially the surrender of Metz by Bazaine. When all his efforts to raise the siege of Paris had failed, and his colleagues in that capital had concluded the armistice, and convoked all electors without regard to political parties to elect a constituent assembly, he issued a decree at Bordeaux, Jan. 31, 1871, disfranchising all functionaries and official candidates of the second empire, and all members of royal dynasties, and announced his determination to continue the war to the last. Though his decree was declared null and void by his colleagues in Paris, of whom Jules Simon went to Bordeaux to put an end to his arbitrary proceedings, he persevered in active opposition, but finally tendered his resignation, which only increased his popularity with the masses of the people. On Feb. 8 he was elected to the national assembly by ten departments, including those destined to be partly annexed to Germany. He gave the preference to that of Bas-Rhin, though it was certain that he would lose his seat by the detachment of Alsace from France. On July 2 he was reelected in the departments of the Seine, Var, and Bouches-du-Rhône, and took his seat for the last named department, which he had formerly represented. In November, 1871, the *République Française* appeared as his special organ in the press, and he was generally recognized as the leader of the radicals. During the political excitement in the early part of 1872 he visited southern France, stirring up the populace everywhere, and his appearance at Marseilles was the occasion of disturbances which were put down by the police. In the latter part of the year he agitated the public mind in S. E. France, especially by his speech at Grenoble (Sept. 26), in which he attacked Thiers, and denounced the Bonapartists and the national assembly, and insisted upon the removal of the government from Versailles to Paris. A number of officers who had attended the banquet at Grenoble in honor of Gambetta were sentenced to 60 days' arrest, and then transferred to another regiment. In 1878 he promoted the election of Barodet and Ranc to the national assembly, in opposition to the candidates supported by Thiers, whom he afterward vainly strove to uphold in his presidency, when the majority in the assembly had determined on his overthrow. His opposition to the prolongation of the powers of Marshal MacMahon, the new president, proved equally futile.

GAMBIA, a British colony of W. Africa, occupying both banks of the river whence it derives its name, and consisting of the island of St. Mary, the ceded mile on the Barra Shere, and McCarthy's island, 180 m. up the river; area, 21 sq. m.; pop. in 1871, 14,190, of whom 56

were white, 136 colored, and the remainder black. The chief settlements are Bathurst, Fort James, and Fort George. Bathurst and Fort James are situated in St. Mary's island; Fort George on McCarthy's island. The climate is generally considered unhealthy. In summer the heat is excessive, the thermometer frequently rising to 106° and 108° in the shade. The soil is rich and alluvial, and liable to periodical inundation. The principal exports are beeswax, ground nuts, and hides, and the imports cotton goods, tobacco, amber, rum, &c. The revenue of the colony in 1870 was £18,969, and the expenditures £21,987. The value of imports was £91,997, of exports £142,518. The total tonnage of vessels entered and cleared in 1870 was 113,914.

GAMBIA, a large river of W. Africa, rising in the interior of the continent, and, after a course of more than 600 m., discharging itself into the Atlantic ocean at Bathurst, in lat. 13° 30' N., lon. 16° 40' W. It is 9 m. broad at its mouth, and is navigable for vessels of 300 tons for 90 m. inland.

GAMBIER, a village of Knox co., Ohio, on the Cleveland, Mt. Vernon, and Columbus railroad, 50 m. N. E. of Columbus; pop. in 1870, 581. It occupies a beautiful site on a high ridge nearly surrounded by Kokosing river, and is the seat of two Episcopal institutions, Kenyon college and the theological seminary of the diocese of Ohio. They were established in 1826, under the auspices of Bishop Chase, with funds collected in England, and are richly endowed. The largest contributor was Lord Gambier, from whom the village is named. The corporation owns 14 buildings. On the college grounds are Ascension hall and Rosse hall, of stone, the church, a fine piece of architecture, and six dwellings; about a mile N. of the college is Bexley hall, in the Elizabethan style, occupied by the theological seminary; and in other parts of the village, Milnor hall, for the preparatory school, and three residences for the professors. The college has a preparatory and a collegiate department. The course in the theological seminary is three years. The number of volumes in the libraries is about 18,800, viz.: theological, 7,000; college, 2,300; college societies, 9,500. In 1871 there were 6 graduates in the theological seminary and 10 in the college. In 1871-'2 the number of theological students was 9; collegiate, 50; preparatory, 32; professors in the theological seminary, 5; in the college, 10.

GAMBIER, James, baron, a British admiral, born in the Bahama islands, Oct. 13, 1756, died at Iver, near Uxbridge, April 19, 1833. He was of a French Protestant family, expatriated by the revocation of the edict of Nantes. Early entering the naval service, he obtained in 1778 the rank of post captain, and as commander of the frigate Raleigh was engaged in the reduction of Charleston in 1780, and in repelling the French attempt upon Jersey in 1781. In 1793 he was appointed to the command

of the Defence, of 74 guns, under Earl Howe, and in the engagement with the French fleet under Villaret de Joyeuse (June 1, 1794) his ship was the first to break through the enemy's line. Advanced to the rank of rear admiral in 1795, and of vice admiral in 1799, he became third in command of the channel fleet in 1801, and in the following year was intrusted with the government and defence of Newfoundland. In 1807 he commanded the fleet in the expedition against Copenhagen, bombarded the city (Sept. 2-5) and captured the Danish fleet, and was rewarded with the dignity of baron, and with the offer of a pension, which he declined. In 1808 he was appointed to the command of the channel fleet, drew up a code of signals and the general disciplinary instructions for the navy, and in April, 1809, attacked the French squadron in the Aix roads and burned five of the ships. Lord Cochrane had command of the British fire ships (catamarans), and in consequence of a disagreement between him and Lord Gambier, the latter requested a court martial, by which he was honorably acquitted. In 1814 he was appointed at the head of the commissioners to conclude a peace with the United States, and the treaty was signed at Ghent on Dec. 24. He afterward lived in retirement, and was made admiral of the fleet on the accession of William IV.

GAMBIR, or *Gambier*, one of several astringent vegetable extracts, much used in tanning, dyeing, &c. Like the allied catechu and cutch, it consists largely of a modification of tannic acid, and is similar to them in properties and uses; indeed, the three names are often applied to the same article, and when used distinctively are not always given to the same product by different dealers and writers. When first introduced its origin was unknown, and being supposed to be a kind of earth it was called *terra Japonica* or Japan earth, a name which it in a measure retains in the arts. Gambir is the product of a tree formerly called *uncaria gambir*, but which is now placed in the genus *nauclea*, of the family *rubiacæ*, to which the Peruvian bark trees belong; it is a native of the East Indian archipelago, and is largely cultivated, especially in the island of Bintang; in its wild state it is a strong climber, but in cultivation it is pruned to form a bushy shrub seven or eight feet high; its leaves are ovate-lanceolate and smooth on both sides, and its green and pink flowers are borne in globular heads in the axils of the upper leaves; the flower stalks at the lower leaves are abortive, bearing no flowers, but are converted into hooked spines. Gambir is obtained by boiling the bruised leaves and young shoots of the tree in water and evaporating the decoction to a thick extract, which is poured into oblong moulds; the masses thus formed are cut into squares, and the drying is completed in the sun. During evaporation starchy matters, and probably other adulterants, are sometimes in-

troduced. It is imported in cane baskets lined with palm leaves. The best qualities are so light as to float upon water, and when broken present a dull porous surface of a light yellowish brown color.

GAMBOGE, or *Gamboge*, a gum resin of Siam and Cochin China, and produced also in Ceylon. The tree from which it is obtained is the *hebradendron cambogioides* of Dr. Graham of Edinburgh. The gum was first carried to Europe by the Dutch in 1608. It is imported into the United States only from Canton and Calcutta. The manner of collecting it in Siam is to catch in leaves or cocoanut shells the yellow milky juice which exudes from the fractured shoots and leaves of the tree, and, transferring this to earthen vessels, leave it to thicken. It is poured when semi-fluid into the hollow joints of the bamboo, and thus receives the cylindrical form and the shape of pipes or hollow cylinders by contraction in solidifying. It is also made into lumps or cakes of several



Gamboge Tree (*Hebradendron cambogioides*).

pounds weight; these are commonly more or less mixed with bits of wood and other impurities. Farinaceous matters are also employed to adulterate it, their presence being detected by the green color communicated to the decoction by adding iodine. The inferior kinds are known in commerce as coarse gamboge. Those of finer quality are brittle, with conchoidal fracture, of reddish orange color in the mass, but bright yellow in powder, or when rubbed with water. It is without odor, and its taste, very slight at first, is soon followed by an acrid sensation in the throat. Its emulsion with much water affords films, which are good microscopic objects for the observation of active molecules. It is wholly taken up by alkaline solutions and by strong acids. Its resinous portion is dissolved by sulphuric ether; the whole by the successive action of ether and water. Dr. Christison gives the following analyses of the different qualities of gamboge:

CONSTITUENTS.	SIAM GAMBOGE.			CEYLON GAMBOGE.
	Pipe.	Cake or lump.	Coarse.	
Resin.....	72.5	64.7	43.2	71.2
Soluble gum.....	22.7	20.8	15.2	19.9
Woody fibre.....	trace.	5.8	18.8	5.7
Fecula.....	5.6	5.6	14.5	...
Moisture.....	4.8	4.1	8.8	8.2
Total.....	100.0	100.0	100.0	100.0

The resinous portion is obtained by evaporating the ethereal tincture. It has a deep orange color, and gives a yellow tint to 10,000 times its weight of alcohol. It is entirely insoluble in water. Johnston named it gambogic acid, and gave its composition $C_{10}H_{10}O_6$. This is said to be an active purgative in the dose of 5 grains, without the drastic and nauseating character of the gum resin. Gamboge is employed as a water color, and also as a medicine. In large doses it is an acrid poison, a single drachm having produced death. It is best used in combination with other and milder cathartics, and is then found an excellent remedy for obstinate constipation. It is also employed in the treatment of apoplexy and dropsy. It is so rarely used except in combinations that its medicinal action is practically confined to these combinations.

GAME LAWS, statutes which declare what birds and beasts are to be considered game, and impose penalties on those who unlawfully kill or destroy them. The game laws of England had their origin in the ancient forest laws, under which the killing of one of the king's deer was equally penal with murdering one of his subjects. From the Norman conquest to the present day game has constantly been a subject of legislation in England. In 1389 the possession of property was made a specific qualification for the privilege of killing game, and it was enacted that "no manner of artificer, laborer, nor any other layman who hath not lands and tenements to the value of 40 shillings by the year, nor any priest nor other clerk if he be not advanced to the value of 10 pounds by the year," should keep hunting dogs, or use other methods of killing game, upon pain of one year's imprisonment. In 1605 the qualification to kill game was increased to £40 a year in land and £200 in personal property. In 1670 the qualification was limited to persons who had a freehold estate of £100 per annum, or a leasehold for 99 years of £150 annual value. Persons who had not these qualifications were not allowed to have or keep game dogs. In 1785 an act was passed requiring persons qualified to kill game to take out a certificate to that effect. The property qualification was abolished in 1831, and the certificate itself, which cost £3 18s. 6d. annually, was made a qualification. By statute 23 and 24 Victoria (1860-'61), c. 90, the certificate is abolished, and an excise tax substituted, which is £3 or £2, according to the portion of

the year for which the privilege is desired. There are many restrictions upon the right which the payment of the tax gives to kill game. It must not be killed on Sunday, nor on Christmas, nor at the season of the year when the pursuit of each kind is prohibited. Poachers and unauthorized persons who destroy game by night are severely punished. No one may trespass on the land of another in pursuit of game, and the unlawful pursuit and killing or wounding of deer kept in enclosed land is felony, punishable with two years' imprisonment. Lords of manors are authorized to appoint gamekeepers to preserve or kill game within the manors. Gamekeepers are authorized to arrest poachers, and to seize all dogs, nets, and other implements used for killing game by unlicensed persons. The sale of game in England is also subject to strict regulations.—In the United States, laws have been enacted by several of the states to protect game from pursuit during certain seasons in order to prevent its entire destruction. But apart from these restrictions, any person who chooses is at liberty to kill or capture as best he can any wild animal, bird, or fish, anywhere in the United States, subject to the usual law against trespassing on the grounds of others.

GAMING, the playing together of two or more persons at some game, whereby one shall lose and the other win money or other property staked upon the issue. The game may be one of chance, as that of faro or a game with dice, or one of skill only, as chess, or of skill and chance together, as whist or backgammon. There is nothing immoral in playing for mere amusement; but if money be staked, it becomes easily, and perhaps necessarily, a sport carried on for the sake of the money in a greater or less degree, and then most moralists have agreed that it deserves reprobation. When this is carried to an extreme degree, and important sums are played for, it is obviously wrong, and deemed so to be universally. But the common law never interfered with gaming, by any kind of prohibition or restraint, so long as there was no fraud. If there was fraud, it operated here as it does elsewhere in law; it avoided all contracts, and money paid in fraud could be recovered back, because no title passed to the payee. And if one cheated at gaming, as by false cards, dice, or other implements, or indeed in any way, he might be indicted as a cheat at common law. Both in England and in the various states of the Union, statutes have been passed for the prohibition or restraining of gaming, or, as it is as commonly called, gambling. Here, all gambling, that is, all playing for money, is prohibited, and therefore it is held that one cannot recover back money lost at play, because the playing itself is illegal; and it makes no difference whether the playing was honest or cheating. But a loser may recover his money from a stakeholder, by demanding it from him before he pays it over to the winner. It has been held in

Indiana that winning any sum of money, however small, at cards, is an indictable offence; and in Tennessee the common form of lottery called "gift enterprises," in which the purchaser of an article is entitled to the chance of winning a prize, has been held to be gaming and indictable. But it has been said in New York, that playing to see who shall pay for the use of the implements, as a billiard table, is not gambling.

GAMMELL, William, an American author, born in Medfield, Mass., Feb. 10, 1812. He graduated at Brown university in 1831, and soon afterward was appointed a tutor in the university; in 1835 he was chosen assistant, and in 1836 full professor of rhetoric. In 1850 he was transferred to the professorship of history and political economy, which chair he resigned in 1864. In 1859 he received the degree of LL. D. from the university of Rochester, and in 1870 was made one of the fellows of the corporation of Brown university. He has published various orations and discourses on literary and historical subjects; also numerous articles in reviews and magazines, especially in the "Christian Review," of which for several years he was one of the editors. He has written a life of Roger Williams, and one of Governor Samuel Ward, for Sparks's "American Biography;" and a "History of American Baptist Missions," at the request of the board of the American Baptist missionary union.

GANDO. I. A kingdom in Africa, lying on both sides of the principal branch of the Niger. It consists of several rich provinces, comprising the western half of Kebbi, Mauri or Arewa, Zaberma, Dendina, a great part of Goorma, a small portion of Borgoo, a large portion of Yoruba, Yauri, and Nufi. Much of the territory is well inhabited, and presents a luxuriant vegetation, embracing the yam, the date, and the banana. The inhabitants are of the Foolah race, and most of them Mohammedans. King Khaliloo, whom Barth visited in 1858, lived in almost monastic seclusion, leaving the administration in the hands of one of his brothers, in consequence of which the provinces were plunged into anarchy and mutual hostilities. II. A town, the residence of the king, in a narrow valley surrounded by hilly chains, in lat. $12^{\circ} 20' N.$, lon. $4^{\circ} 50' E.$, 615 m. N. E. of Cape Coast Castle. It is intersected from N. to S. by the broad and shallow bed of a torrent, the borders of which are covered with luxuriant vegetation, and is adorned with trees, among which the banana is prominent. The onion of Gando is superior in size and quality to any produced in the neighboring districts. The inhabitants prepare cotton cloth of excellent quality, but their dyeing is inferior.

GANGES (Hind. *Gangā*, stream), one of the great rivers of British India, rising on the S. slope of the Himalaya mountains, and flowing southerly and easterly into the northern portion of the bay of Bengal. The river Bhagirathi, usually regarded as its true source, has its origin

in the territory of Gurhwal, 10 m. from the temple of Gungootree, a favorite resort of Hindoo pilgrims. It flows from a cave in a perpendicular ice wall at the extremity of a glacier, as a torrent about 40 yards wide, not far from lat. $30^{\circ} 54' N.$, lon. $79^{\circ} 7' E.$, at an elevation of 18,800 ft. above the sea. The surrounding mountains are upward of 20,000 ft. in height. It is not until the Bhagirathi is joined by the Aluknunda, 120 m. from its source, that the stream is called the Ganges. At Hurdwar, 47 m. further down, the river reaches the great plain of India, here 1,024 ft. above the ocean level. Thence to Allahabad, where it joins the Jumna, a distance of 488 m., the course of the Ganges is S. S. E., with an average fall of 22 in. to the mile. Its most important affluent between these two cities is the Ramganga, an eastern tributary. From its confluence with the Jumna, the Ganges pursues a winding course eastward, 563 m., to the head of the delta. In this portion of the river the fall is about 5 in. to the mile. Among the important tributary streams are the Goomtee, on which Lucknow is situated, the Gogra from the north-west, the Gunduk flowing from the west and the Oosy or Oosi from the east of Katmandu, the distant capital of Nepal, and the Sone from central India. The head of the delta of the Ganges is about 80 m. below Rajmahal, and 216 m. in a straight line from the bay of Bengal. At this point the first arm is given off; it flows southward, and is known as the Bhagrutti. Further to the southeast the main stream throws off another branch to the south called the Jellinghi, and still another called the Mata-bunga. These three western offshoots unite to form the Hoogly, the great branch of the Ganges, on which Calcutta is situated at a distance of about 100 m. from the sea. The embouchure of the Hoogly is in lat. $21^{\circ} 40' N.$, lon. $88^{\circ} E.$ The principal stream, still retaining the name of Ganges, continues to flow in a southeasterly direction, sending out other branches southward, which combine and form the Hauringotta arm of the delta. Finally, it partly intermingles its waters with those of the Brahmapootra, and falls into the bay of Bengal near that river, but by a separate mouth. The average descent of the Ganges from the head of the delta is 8 in. per mile.—The entire length of the Ganges is between 1,500 and 1,600 m. Its depth and width and the rapidity of its flow vary greatly at different seasons. There is an annual rise of its waters, generally beginning at the end of May and attaining its height in September. The rise is 7 ft. at Calcutta, without taking into account the tide, and from 29 to 45 ft. at Allahabad. The average width of the Ganges on its whole course is estimated at 1 m. in the dry season. The section between Hurdwar and Allahabad abounds in shallows and rapids, but is navigable by small boats throughout its whole extent, and by steamers for passenger traffic over the lower four fifths of its length. At Allah-

bad it is a mile wide, while the width of the Jumna is but 1,400 yards. From this city down to the head of the delta the river is navigable throughout the year for vessels drawing 18 in. of water. The greatest breadth ordinarily attained at Benares, 75 m. below Allahabad, is 1,000 yards and the maximum depth 78 ft.; in the dry season these figures are reduced to 1,400 ft. and 85 ft. respectively. The course and current of the river, especially in its lower portion, are extremely subject to change. Old channels are filled up and abandoned for new ones which the action of the water has excavated; new islands are formed around sand bars or sunken objects which serve as nuclei for mud deposits; and at the same time old islands are being swept away. The Hoogly is the only arm which can be ascended by large ships for any considerable distance. Opposite Calcutta it is about 1 m. wide at high

water.—The coast region of the delta of the combined rivers Ganges and Brahmapootra consists principally of a vast labyrinthine network of salt-water streams and creeks. Fresh-water channels, however, communicating with the Hoogly, intersect the extensive wilderness of wooded islands along the coast, known as the Sunderbunda. This pestilential tract has an area of more than 7,000 sq. m., and is haunted by innumerable crocodiles, tigers, and other wild animals. In the Sunderbunds the ordinary rise and fall of the tide is between 7 and 8 ft. When the Ganges is low, the tidal current extends as far inland as the head of the delta, but in the flood season it is overcome by the increased volume and velocity of the river, and is imperceptible except near the coast. The whole delta district is subject to inundation during the annual rise of the river. A tract of the Lower Provinces 100 m. in width is

The Source of the Ganges.

then completely covered with water, which recedes in October, when the rice crop is planted. These inundations become very destructive if the descending current of the river flood happens to be checked by high tides and strong gales in the bay of Bengal. The quantity of fine mud and sand brought down by the Ganges and Brahmapootra is so large that it discolors the sea to a distance of from 60 to 100 m. from the delta. At Ghazepoor, 500 m. from the sea, 500,000 cubic feet of water per second flow down the Ganges during the four months of the flood season, and about 100,000 cubic feet per second during the rest of the year. In 1831-'2 the total amount of solid matter suspended in the water thus flowing down was estimated to be 6,868,077,440 cubic feet in a year. Lyell's estimate of the entire quantity of mud borne down to the bay of Bengal in one

year by the Ganges and Brahmapootra is 40,000 millions of cubic feet. In this calculation he assumes that the annual water discharge of the latter river is equal to that of the Ganges, and that the proportion of sediment in both rivers is about a third less than the Ghazepoor estimate. Geological borings at Calcutta indicate that a general subsidence of the delta has taken place. To this subsidence is attributed the fact that the fluvial mud which is deposited by successive inundations does not increase the elevation of the plains of Bengal.—Three well marked species of crocodile infest the Ganges in great numbers. The gavial, which is the characteristic Gangetic crocodile, lives only in fresh water and feeds exclusively on fish. Its range extends from the delta to the northern branches of the river, 1,000 m. from Calcutta. The other kinds, known as the

koomiah and the muggar, inhabit both fresh and salt water, and prey with great boldness upon men, and upon animals wild and domestic. —The Ganges is the main artery of an extensive and intricate natural system of Himalayan drainage. Of the 19 or 20 affluents which it receives after leaving the mountains, 12 are said to be larger than the Rhine. Considered as a whole, the Gangetic plain is one of the finest and most fertile countries in the world. It is the most populous portion of India, and that in which agriculture is most flourishing. The rainfall of the Ganges basin above Allahabad, however, being but little more than 30 in., the agricultural interests of that region required a permanent system of irrigation, to supply which the Ganges canal was constructed. It was commenced in 1848, opened in 1854, and is the greatest work of irrigation ever completed. It extends in a southeasterly direction from Hurdwar to Cawnpore, traversing the country between the Ganges and the Jumna, with numerous offshoots which, like the main channel, are adapted for internal navigation as well as for irrigation. The length of the main channel is 348 m., and the branches are 306 m. long. The distributaries have an aggregate length of 3,078 m., and water 767,000 acres in 3,061 villages. In 1871-'2 the profits of the Ganges canal were £66,234, being 2·78 per cent. on the capital.—The Ganges occupies a prominent place in Hindoo mythology. It is revered as the most sacred of rivers by the Hindoos, who convey its sanctified waters to all parts of India for use in ceremonial ablutions. There are particular places along the banks whence it is regarded as most desirable to obtain the water, but that from Benares is revered as the holiest of all. Here and elsewhere numerous and handsome flights of stone steps, called ghauts, render access to the river easy.—The principal cities and towns on the banks of the Ganges are Furruckabad, Cawnpore, Allahabad, Benares, Ghazepoor, and Patna; and on the Hoogly branch, Calcutta.

GANGLION (Gr. γάγγλιον, a little swelling), in anatomy, a small rounded or elongated nervous mass, of a reddish gray color, situated in the course of the nerves. There are two kinds of nervous ganglia, one forming part of the cranial system of nerves, the other part of the sympathetic system; the first kind are situated near the origins of many of the cranial and of all the vertebral nerves, and on the posterior or sensory root of the latter; the second are generally placed along the sides of the anterior surface of the spinal column, from the head to the coccyx, the two great semilunar and cardiac ganglia coming near the median line. They are composed of two substances, one white like the medullary substance of the brain, the other reddish gray, somewhat resembling the cerebral cortical substance; the internal medullary filaments are the continuation of the nerve upon which the ganglion is situated. The sympathetic system of gan-

glia is considered by some as a series of more or less independent centres, giving off nerves to the organs of nutrition or communicating branches to the cerebro-spinal system; according to others, these ganglia and their associated nerves form a special system with numerous ramifications, the sympathetic system presiding over the involuntary contractions of the heart and digestive apparatus, and all the processes concerned in secretion, nutrition, and exhalation, and in disease conveying different sympathetic phenomena from one part of the organism to another. Strictly speaking, all the nervous centres in the highest vertebrates may be called ganglia; even the hemispheres of the human brain may properly be styled cerebral ganglia. The principal ganglia of the head are the ophthalmic, which sends branches to the iris and the vascular apparatus of the eyeball; the otic, intimately connected with the organ of hearing; Meckel's or the spheno-palatine, ministering to the senses of smell and taste; the submaxillary, whose branches proceed almost entirely to the gland of that name; the Gasserian, of the fifth pair of nerves; and those near the roots of the pneumogastric and glossopharyngeal. In the neck are the superior, middle, and inferior ganglia of the sympathetic, and the origins of the cardiac plexus which supplies the heart; in the chest, the 12 thoracic ganglia on each side, from which originate the splanchnic nerves which go to join the semilunar ganglia and the solar plexus; in the abdomen, the latter sends branches which accompany all the divisions of the aorta. There are besides these the lumbar and sacral ganglia on each side of the spine, distributing their branches to the organs in the pelvis. The so-called lymphatic ganglia are glandular, and not nervous masses. In the invertebrata ganglia are the highest form of nervous centres, and occur either isolated or connected together by single or double longitudinal cords; they perform the functions both of the cerebral and spinal centres of the higher animals.—In surgery, a ganglion is a small indolent fluctuating tumor, developed in the course of the tendons, containing a semi-fluid secretion enclosed in a cyst, generally communicating with the tendinous sheath. It is a dropsy of the synovial sheath, caused by friction, some wrench or tension of the tendon, or the sequence of some rheumatic or gouty disease; the light of a candle may be seen through it. The most common situation is about the wrist and fingers, though it may occur in the course of any tendon. When there is no inflammation, the best treatment is to puncture the tumor by the subcutaneous method, in order that the contained fluid may escape into the surrounding areolar tissue and be absorbed; pressure and cold applications should then be applied. If this fail, stimulating liniments and even blisters may be tried, to induce absorption. When unconnected with a tendinous sheath, the tumor may be dissected out, punctured like an abscess, or

transfixed with a seton; the subsequent thickness may be removed by the vapor or steam bath and douche; any rheumatic taint requires to be corrected by appropriate remedies. A popular way of treating these tumors is to rupture them by a strong and sudden blow; those on the back of the wrist and hand may thus be scattered without danger.

GANGRENE (Gr. γάγγραινα), the loss of life in any of the soft parts of the body, without extinction of the vital powers in the rest of the organism. The term *sphacelus* has been applied to the condition in which gangrene may terminate, the utter and irrecoverable death of a part, while in some stages of gangrene the circulation may not be completely arrested, the sensibility of the nerves not entirely gone, and recovery of the local loss of action not impossible. The death of the bony tissue is called *necrosis*. When gangrene is the consequence of violent inflammation or of the obstructed return of venous blood, the affected parts are gorged with fluid, constituting humid gangrene; while dry gangrene generally arises from a deficient supply of arterial blood or from constitutional causes, accompanied by very slight or by no inflammation, the mortified part becoming dry and hard; the gangrenous portion in the former case is called a slough, in the latter an eschar. The local predisposing causes are congestion and deficient circulation; the constitutional are weakness from disease, old age, or privation. The exciting causes are mechanical and chemical injuries, especially gun-shot, lacerated, and poisoned wounds; insufficient supply of arterial or obstructed return of venous blood, as in the gangrene from ossified arteries in the first case and that from heart disease and varicose veins in the second; and injury or division of nerves. The areolar tissue is most subject to gangrene; after this come tendons and ligaments, denuded bone, the skin, and the muscles, in the order of enumeration. Gangrene spreads slowly or rapidly, according to the accompanying inflammation or the energy of the vital processes. When inflammation is about to end in gangrene, the redness becomes livid, with diminution of pain and sensibility, though the swelling may be increased; the parts become soft and cold, and emit an odor of decomposition; the livid color, when the disease is spreading, is gradually lost in the surrounding skin, but when the dead portion is to be cast off, a bright red line separates the healthy from the gangrenous tissue, called the "line of demarcation;" in a healthy person there may be high accompanying fever, but in a debilitated constitution the symptoms will be those of prostration and typhoid. The indications of treatment are to diminish the inflammation by general and local means; to support the strength by tonics and stimulants, when the gangrene is extensive or the system debilitated; to quiet restlessness and nervous irritability by opium; and to facilitate the separation of the dead parts by warm and stimu-

lating applications, and by incisions to permit the free escape of fluids whose absorption might propagate the disease to internal vital organs. Amputation of a limb is sometimes the only way of arresting the spread of gangrene. Surgery often has occasion to produce gangrene as a remedial measure, in the removal of tumors and diseased growths; hæmorrhoidal swellings, nasal and uterine polypi, erectile tumors, cancerous growths, &c., are effectually and safely removed by cutting off their supply of blood by ligature of the principal vessels. Gangrene is always a dangerous symptom, especially in very young or very old persons, and in weakened constitutions; and when terminating favorably, it may leave behind it tedious suppurations, fistulous ulcers, and various deformities. Hospital gangrene, or sloughing phagedæna, a putrid disease caused by crowding sick and wounded men into ill-ventilated and dirty rooms, is one of the most terrible accompaniments of war, often destroying more than the bullet and the sword; and the army surgeon generally finds his best directed efforts set at defiance by the force of surrounding and insurmountable obstacles. The principles of treatment are the same as in ordinary gangrene.

GANJAM, a town of India, in the district of the same name, presidency of Madras, on the left bank of the river Rosikoila, just above its entrance into the bay of Bengal, 168 m. N. E. of Vizagapatam. It was formerly the capital of the district, had harbor fortifications, and was noted for its fine public buildings, houses, and gardens; but in 1835 it was desolated by a fever, and since then it has been almost deserted and falling to decay. Still it has several cotton factories and carries on a considerable trade.—The district, one of the five formerly called the Northern Circars, has an area of 6,400 sq. m.; pop. in 1871, 1,487,227. The coast is bold and rocky, with no large harbors, succeeded by a wide sandy plain extending to a range of hills. The rivers are all dry in the summer, and the district is sometimes visited by severe drought and famine; in 1866 nearly half the population was lost from this cause. The staple productions are rice, maize, sugar cane, millet, pulse, oil seeds, wax, lac, gums, dyestuffs, arrowroot, and cotton.

GANNAL, Jean Nicolas, a French chemist, born in Saarlouis, July 28, 1791, died in Paris in January, 1852. After being employed in a drug shop, he was in 1808 attached as an apothecary to the medical department of the French army, and in 1816 he was the chemical assistant of Thénard in his lectures at the Sorbonne. He afterward devoted himself to useful inventions and to industrial enterprises connected with them. He invented a new kind of chimney, the first elastic rollers for the printing press, the refining of borax, a new method for melting and hardening tallow employed in making candles, &c. In 1827 he received the Montyon prize from the institute

for his system of chloric inhalation for catarrh. He is best known, however, by his process for embalming, for which he received the same prize. It consists in injecting a solution of sulphate of aluminum into the carotid artery.

GANNET, a web-footed bird, of the family *sulidae* and genus *sula* (Briss.). The genus is characterized by a bill longer than the head, strong, straight, and broad at the base; the sides compressed and grooved toward the tip, which is slightly curved, with the lateral margins obliquely and unequally serrated; the nostrils basal, linear, in a lateral groove, and almost invisible; the wings long and pointed, the first and second quills longest; the tail long and graduated; the tarsi short and stout, rounded in front and keeled behind; the toes long, all four connected by a full membrane; the claws moderate and rather flat, the middle one serrated, and the hind one rudimentary; beneath the lower mandible is a naked sac, capable of moderate distention. There are about ten species described, in various parts of the world, of which two are natives of the western hemisphere, the booby (*S. fber*, Linn.), treated under its own title, and the gannet, or solan goose (*S. bassana*, Briss.). The gannets are usually found in immense numbers on desert and rocky islands near the mainland, migrating southward in small parties on the approach of cold weather; they sometimes float lightly on the sea, but are generally seen on the wing; their flight is powerful, rapid, buoyant, and long sustained; their food consists of fishes which swim near the surface, upon which they dart headlong from a considerable height, making a great splash, and sometimes remaining under water a minute or two; they swallow

gray; bare space about the eye and on the neck blackish blue; iris white. The length to end of tail is 40 in., to end of wings 38, the extent of wings about 6 ft., and the bill 4 in.; the weight is 7 lbs. The female is like the male, but smaller. The young are brown and white above, and grayish white below. This species breeds in great numbers on the rocky islands near the coast of Labrador, and after the breeding season, in May and June, is found all along the Atlantic states to the gulf of Mexico; it is entirely maritime, and never seen inland unless forced in by violent gales. The flight, when travelling, is low, performed by 80 or 40 flaps of the wings, and then by sailing for an equal distance with extended neck; the walk is exceedingly slow and awkward. The nest is a hole in the earth surrounded by weeds and sticks matted together for a height of 10 to 20 in., and only a single pure white egg, about 8 in. long, is laid in it; the young are hatched in about a month; the males assist in incubation. They congregate on the same rock in vast numbers, and are quarrelsome during incubation, being fond of stealing from each other the materials for the nests, which are sometimes brought a distance of 80 miles. A young gannet, with its large head, closed eyes, thin neck, small wings, large abdomen, naked skin, and bluish black color, is a most uncouth and disagreeable object. When shot at or wounded, gannets disgorge their food like vultures. They have very few enemies among birds or beasts; the eggs and young are sometimes devoured by the larger gulls. According to Audubon, the feathers on the lower parts are very convex externally, giving the appearance of light shell work.

GANNETT, Ezra Stiles, an American clergyman, born in Cambridge, Mass., May 4, 1801, died from a railroad accident at Revere, Mass., Aug. 26, 1871. He studied at Phillips academy, Andover, entered Harvard college in 1816, and graduated in 1820; studied the three following years in the divinity school at Cambridge; received ordination as colleague with William Ellery Channing, June 30, 1824, in the Federal street church, Boston; and upon Dr. Channing's death in 1842 he became sole pastor. The congregation subsequently removed to Arlington street, and Dr. Gannett continued to be its pastor until his death, a period of 47 years, with only an intermission of two years, during which he resided in Europe on account of his health. He published many occasional sermons and addresses, and from 1844 to 1849 was one of the editors of "The Christian Examiner."

GANOIDS (Gr. γάνος, splendor), in Müller's classification, an order of fishes, having either enamelled scales, bony plates, or a naked skin; fins generally, but not always, covered anteriorly by spiny plates (*fulcræ*); the internal skeleton sometimes osseous, as in the gar pike, or partly cartilaginous, as in the sturgeons; the vertebral column occasionally extending to the end of the upper caudal lobe; nasal apertures

Common Gannet (*Sula bassana*), adult and young.

the fish head foremost, and their gullet is so expansible as to take in the largest herring. The common gannet (*S. bassana*) has a close dense plumage, of a general whitish color, buff yellow on the head and hind neck, and primaries brownish black; the bill is pale bluish

double; gills free and lying in an operculated cavity, with or without an opercular gill, a pseudo-branchia, and blowing holes; the arterial trunk always with numerous valves; no decussation of the optic nerves, and the ventral fins abdominal; there is always an air bladder, and a duct communicating with the œsophagus; the eggs are conveyed from the abdominal cavity by tubes; like the shark family, they have a thymus gland, and often a spiral valvular fold in the intestine. Müller divides the ganoids into four families: 1, containing the American gar fish; 2, the *polypterus* of Africa; 3, the *amia*, or mud fish of America; and 4, the sturgeons; these will be described under the first, third, and fourth titles respectively. Prof. Agassiz is inclined to elevate the ganoids from an order to a class, separate from ordinary bony fishes, and superior to them in organization, though inferior to the selachians (sharks and rays); he makes them the third class of the branch vertebrata, with the three orders of coelacanth, acipenseroids (sturgeons), and sauroids (gar fish), with three additional doubtful orders of siluroids, plectognaths (*balistes*, *ostracion*, and porcupine fishes), and lophobranchs (*hippocampus*, pipe fish, and *pegasus*).—The remainder of this article will be devoted to the consideration of fossil ganoids, and to the interesting questions connected with their structure and geological distribution. Ganoid fossil scales, whether angular, rhomboidal, or many-sided, are imbricated like the slates of a roof, and formed of an outer plate of enamel, an inner porcelain layer, and an intermediate reticulated structure analogous to the diploë between the tables of the human skull. The fin rays of the ganoids are bare enamelled bones, each consisting of a plate of enamel on each side and a lamina of bone between them; the necessary flexibility of such rays is secured by joints which extend through the rigid enamel, leaving the central bony plate undivided, on the principle of the half-sawed moulding which the carpenter wishes to bend at an angle or around some curved surface. The dermal or external skeleton of the ganoids is so remarkably developed, that in many instances it has served to determine the forms of genera and species in the old red sandstone and carboniferous strata, every other portion having perished, as their internal skeletons were either very slight or entirely cartilaginous; enamelled plates represent the head, enamelled imbricated scales indicate the form and proportions of the body, and enamelled rays show the position and outline of the fins. The instances of great development of the outer skeleton in higher animals are few, being limited principally to the armadillo and pangolin among mammals, the tortoises and crocodiles among reptiles, and the gar pikes and sturgeons among fishes. The earliest fishes, those of the Silurian epoch, seem to have been all placoids; in the following age, that of the old red sandstone, the ganoids appeared in great numbers, and with the placoids

formed the entire class of fishes for unknown millions of years, that is, through the old red sandstone, carboniferous, Permian, triassic, and oolitic periods, down to the cretaceous epoch, when ordinary bony fishes were brought into existence; the age of these two orders corresponding nearly to the reign of the ferns, palms, coniferous trees, and their allies among plants. When the bony fishes became the prevailing type, the other orders diminished in proportion, so that at the present time the gar pikes and the sturgeons are the chief representatives of the old powerful and numerous ganoids. In the human family we see similar instances of nations reaching their culminating point, and then disappearing or lapsing into barbarism; the Aztecs of Central America and the Copts of Egypt are the remnants of the great races which built the mounds of the Mississippi valley and the Egyptian temples and pyramids. In the words of Hugh Miller: "But in the rivers of these very countries, in the *polypterus* of the Nile or the *lepidosteus* of the Mississippi, we are presented with the few surviving fragments of a dynasty compared with which that of Egypt or Central America occupied but an exceedingly small portion of either space or time. The dynasty of the ganoids was at one time coextensive with every river, lake, and sea, and endured during the unreckoned eons which extended from the times of the lower old red sandstone until those of the chalk." Among ganoids are found some of the strangest ichthyic forms, having a structure and placoid affinities no longer seen in nature; these gigantic and strange fishes were of the first rank in their class, and, being then the only representatives of the vertebrates, exhibited characters belonging to the higher class of reptiles, of which they were the prophetic types. These reptilian fishes attained their greatest number and largest size during the carboniferous period, and were remarkable both for their formidable offensive weapons and their strong defensive armor. This remote age was as fully characterized by bloodshed and destruction of animal life as any since the creation of man; indeed, no animal ever had more powerful teeth than the ganoid *rhizodus* of the coal fields, sharper than and four times as large as the hugest living crocodile possesses; the dorsal and caudal spines of some of the contemporary placoids far exceeded in size and destructive powers those of any living shark or ray; where such weapons were employed, defensive armor was necessary; hence the enamelled scales of the ganoids. In the lepidoid or acanth family, confined chiefly to the old red sandstone and carboniferous strata, the teeth are small, brush-like, and in several rows, or obtuse and in a single row; the scales are flat, rhomboidal, parallel to and wholly covering the body; all those occurring in strata earlier than the Jurassic have the tail heterocercal or with the spine prolonged into its upper lobe; it has no representative among living fishes. Among the most

interesting genera is *dipterus*, in which *D. macrolepidotus* of the old red sandstone resembles a fish carved in ivory, crusted with



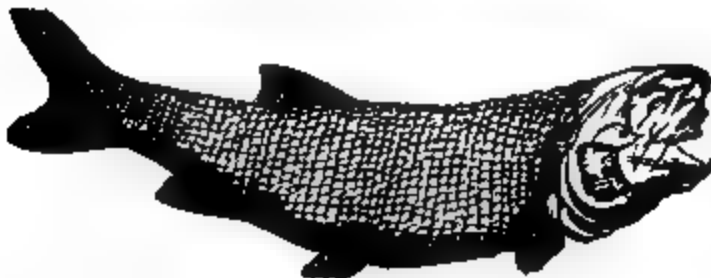
Dipterus macrolepidotus.

enamel, and thickly dotted with minute puncturings; with circular scales, thickly enamelled fin rays, strong angular pectorals, scale-



Osteolepis.

protected ventrals like the ichthyosaurus, and a long dorsal fin, also British Devonian, has two anals alternating with two dorsals, large and rounded pectorals, small ventrals, large mouth, and scales of moderate size. Among the genera most numerous are *palmonisus*, a well proportioned fish, w



Palmonisus.

fins and scales, a single dorsal opposite the space between the ventrals and anal, and all with small rays at their margins—about 80 species in North America and northern and central Europe; *eurynotus*, a flattened and bream-

Tetragonolepis.

shaped species, with large dorsal, ventrals, pectorals, and head; and *anthodes*, with lengthened body, very small scales, dorsal opposite anal,

no ventrals, large pectorals, and very wide mouth, in proportions resembling the conger eel or ling. Among those most numerous in the Jurassic age are *tetragonolepis*, with a broad flattened body, rapidly decreasing to the tail, rounded head, moderate fins, and pointed teeth—about 20 species in Europe; *lepidotus*, with body shaped like a carp's, large rhomboidal scales, and caudal fin almost square—about 30 species; and *pholidophorus*, resembling the herring, but with rhomboidal scales, homocercal or equal-lobed tail, and small teeth—more than 30 species.—In the family of cephalaspids, which contains the extreme acanth forms for a long time not recognized as fishes by palæontologists, the body and head are covered with a few non-imbricated plates or shields; the heterocercal tail, covered with imbricated scales, has no true caudal fin; and in place of pectorals are two long bony appendages or sti-

Pterichthys Milleri.

lets; the dorsal cord like that of the sturgeons; they belong to the old red sandstone formation, and were short-lived in comparison with some other ganoids. The genus *pterichthys* (winged fish), discovered by Hugh Miller in the Cromarty sandstone, first appears at the base of the old red sandstone, and disappears with its upper beds; one of the best known species, *P. Milleri*, is 8 ft. long; it is as strange a form among fishes as the plesiosaurus and pterodactyl among reptiles; in his work on "Fossil Fishes," Prof. Agassiz says: "It is impossible to find anything more eccentric in the whole creation than this genus." Hugh Miller describes it, when seen from the under surface, as resembling "the human figure, with the arms expanded as in the act of swimming, and the legs transformed, as in the ordinary figures of the mermaid, into a tapering tail." There is no separation between the head and trunk, and the whole animal is in a complete armor of solid bone; the strong helmet of the head is perforated in front by two circular holes for the eyes, the body above and below protected by a curiously plated cuirass, and the tail sheathed in a flexible mail of bony scales; the plate-covered arms are articulated by a complicated joint to the lower part of the head; the flat

abdomen and ribbed and groined arch of the back add to the strength of the armature without increasing the weight—the creature resembling a “subaqueous boat, mounted on two oars and a scull;” and this strange fish is a characteristic organism of the old red sandstone. The genus *coccosteus* has not the pectoral appendages of the preceding animal, and the head and anterior part only of the trunk are covered with a bony helmet and cuirass, the caudal portion being naked; it has one dorsal and one anal fin; the mouth is furnished



Coccosteus.

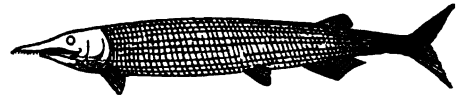
with small, equal, conical teeth. The most remarkable peculiarity in this fish, unique among vertebrated animals as far as known, is that the jaws possessed both the usual vertical motion, and also a horizontal movement as in crustaceans, indicated by the two sets of teeth, one on the upper edge of the jaw and the other on the line of the symphysis, the latter of which, if brought into action at all, could only be so by the lateral movement of the jaws. The jaws of *coccosteus* are also interesting, as presenting the most ancient internal bone which has displayed its structure under the microscope. The jaw of this ancient fish shows the Haversian canals, the lacunæ and osseous cells, as in the bones of man at the present time; showing the extension of the same plan through the most distant ages, and by a fair inference to the beginning of vertebrate existence. The genus *cephalaspis*, or buckler-head, had a thin triangular body, and crescent-shaped head covered with a singular shield-like plate, with lateral prolongations extending along the sides; body covered by vertical rows of scales; no ventrals nor pectorals, and two dorsals. It lived at the same time with large placoids, armed with dorsal spines (of which the spines only remain),



Cephalaspis.

and with a gigantic lobster-like crustacean more than 4 ft. long; it belongs to the middle portion of the old red sandstone.—The family of sauroids, of which the gar pike is one of the few living representatives, had pointed conical teeth alternating with small brush-like ones; the skeleton bony; the scales flat, rhomboidal, and completely covering the body; those living before the Jurassic age had unequal-lobed tails, while the homocercal genera flourished at a more recent period. The genus *megalichthys* was a formidable fish of large size; the scales

of the body and the plates of the head had such a brilliant enamelled surface, “that they may still be occasionally seen in the shale of a coal pit, catching the rays of the sun, and reflecting them across the landscape, as is often done by bits of highly glazed earthenware or glass.” The genus *diplopterus* was of smaller size, with an elongated tapering body, flat head, rounded muzzle, two dorsals, two anals, and the caudal fin truncated almost vertically, the lobes coming off laterally from a prolongation of the vertebral column; their scales were of great brilliancy, and must have flashed brightly through the woods of the coal period, as they leaped into the air in sport or in pursuit of prey. The genus *pygopterus* had the fins greatly developed, and a heterocercal tail. *Aspidorhynchus* had a much elongated body, homocercal tail, the upper jaw prolonged into a beak and extending beyond the lower; the scales large. The former belongs to the coal and magnesian limestone formations,



Aspidorhynchus.

and the latter to the Jurassic.—The cœlacanth family is characterized by having all the fin rays and bones hollow, a peculiarity not found in other ganoids; and all the fin rays are stiff, articulated only at their bases, and supported on interapophyseal small bones; they occur in all the ages from the lower Devonian to the chalk formations, most numerous in the red sandstone and coal strata. In the genus *asterolepis*, one of the earliest and largest of the ganoids, the bony plates of the head are ornamented with star-like markings, and the scales of the body are delicately carved; Hugh Miller says its cranial bucklers have been found in the flag stones of Caithness, “large enough to cover the front skull of an elephant, and strong enough to have sent back a musket bullet as if from a strong wall.” It must have equalled in size the largest alligator, and its teeth throughout the jaw had the reptilian peculiarity of being received into deep pits opposite, causing them when the mouth is shut to lock like the serrations of a bear trap. The genus *holoptychius* was of very large size, with rough scales several inches in diameter, the cranial bones sculptured like those of the crocodile, and conical teeth larger than those of any living reptile. The *H. (rhizodus) Hibberti*, the largest of about 20 described species, was of such a giant size that the words applied in Job to leviathan might appropriately be given to it; this reptilian fish must have been 40 ft. in length, with teeth three times larger than those of the largest crocodile, and covered with an impenetrable coat of mail. There were several smaller holoptychians in the red sandstone, even more strongly armed than this giant of the coal period.—For further details

on fossil ganoids of these and other families, see the great work of Prof. Agassiz on "Fossil Fishes;" and for a popular description of the most interesting genera, the writings of Hugh Miller, especially "The Testimony of the Rocks," "Footprints of the Creator," "Old Red Sandstone," and "Popular Geology."

GANS, Eduard, a German jurist, born of Jewish parents in Berlin, March 22, 1798, died there, May 5, 1839. He studied successively at the universities of Berlin, Göttingen, and Heidelberg, and became early associated with Hegel, whose philosophical opinions he adopted, and through whose influence he conceived a strong antipathy to the historical school of jurisprudence, then supported by the great names of Savigny and Hugo. In 1820 he became a doctor of law and published his *Schöllen zum Gajus*. In his great work *Das Erb-recht in weltgeschichtlicher Entwicklung* (4 vols., Stuttgart, 1824-'35), he assails the scientific principles of the historical school of jurisprudence, and aims at treating the science of law according to the Hegelian philosophy. He visited France and England in 1825, and in 1826, having become nominally a convert to Christianity, was appointed professor extraordinary in the university of Berlin. His clear and vivacious manner of lecturing was strikingly in contrast with the monotonous gravity usual in German universities, and gained for him crowded audiences. He began a course in 1835 upon the history of the last 50 years, but was obliged by the government to suspend it. He was among the most active of those who prepared the posthumous edition of the complete works of Hegel, of which the *Philosophie der Geschichte* was in great part elaborated by Gans.

GANSEVOORT, Peter, an American soldier, born in Albany, July 17, 1749, died July 2, 1812. In 1775 he received the appointment of major in the second New York regiment, and joined the army which under Montgomery invaded Canada. In March, 1776, he was made a lieutenant colonel, and at a later period of the same year he was appointed to the command of Fort George. In 1777 he was placed in command of Fort Stanwix, which he gallantly defended against a vigorous siege of 20 days by British and Indians under St. Leger, whose coöperation with Burgoyne he thereby prevented, and received the thanks of congress. In 1781 the state of New York raised him to the rank of brigadier general. He was successively commissioner of Indian affairs, commissioner for fortifying the frontiers, and military agent. In 1809 he was appointed brigadier general in the United States army.

GANYMEDE (Gr. Γανυμήδης), a Trojan prince, son of Tros and brother of Ilus, was the most beautiful of mortals, and was carried off, according to the legend, by the eagle of Jupiter, to succeed Hebe as cup-bearer to the gods on Olympus. Astronomers have placed him among the constellations under the name of Aquarius,

or the water-bearer. He is represented in the fine group of statuary in the Pio-Clementine museum at Rome, and in the group of "Hebe and Ganymede" by Crawford, in Boston.

GAP (anc. *Vapincum*), a town of France, capital of the department of Hautes-Alpes, 47 m. S. E. of Grenoble, at the confluence of the Bonne and the Luye, affluents of the Durance; pop. in 1866, 8,219. It is situated in a valley shut in by mountains, on which the vine flourishes to the height of 2,000 ft., and is of great strategical importance. It is badly built, but contains a handsome Gothic cathedral. It has been much improved within the present century, and among the new public works are an extensive aqueduct and reservoir. It trades in grain, fruits, cattle, leather, and wool, and has manufactures of linen, silk, and woollen. The town is of Celtic origin, and was at first called Vap. It became a bishop's see in the 5th century. In the 10th century the bishops received the title of prince, of which they were deprived by Francis I.

GARAKONTHIE, Daniel, an Onondaga chief, died at Onondaga, N. Y., in 1675. For many years he exercised great influence over the Five Nations, and was esteemed by the English of New York and the French of Canada. He was the chief negotiator of the league, and endeavored to keep the tribes at peace with the French, frequently prevented the sending out of war parties, and delivered prisoners. He enabled French missionaries to build a chapel at Onondaga in 1667, and after long reflection embraced Christianity and was baptized at Quebec by Bishop Laval in 1670. Though advanced in years, he attempted to learn to read and write French.

GARAT, Dominique Joseph, a French writer and politician, born at Ustaritz, near Bayonne, Sept. 8, 1749, died Dec. 9, 1833. He was a contributor to the *Encyclopédie méthodique* and the *Mercur de France*. He published a eulogy on L'Hôpital in 1778; was elected to the constituent assembly in 1789, and reported the sittings of the assembly in the *Journal de Paris*; succeeded Danton as minister of justice, and informed Louis XVI. of the sentence of the convention. From the ministry of justice he was transferred to the home department. He coöperated with the enemies of the Girondists, tried in vain to save some of the latter, and left office in August, 1793. Under the directory he was sent as ambassador to Naples, where he was ill received. In 1805 he received a mission to Holland. On the downfall of Napoleon he tried every means of propitiating the Bourbons, but in 1816 was excluded from his seat in the institute. He now wrote one of his most interesting books, *Mémoires historiques sur la vie de M. Suard*, and not long afterward retired to his native mountains, where he led an obscure but religious life.

GARAY, János, a Hungarian poet, born at Szekszárd, in the county of Tolna, in 1812, died in Pesth, Nov. 5, 1853. His chief produc-

tions are the epic poems "Csatár," "Sophia Bosnyák," "The Wife of Frangepán," and "St. Ladislás;" the dramas of "Arboez" and "Elizabeth Báthory;" "The Arpads," a collection of ballads on the history of that Hungarian dynasty; and *Balaton-i kagylók* ("Shells from the Balaton"). He also wrote numerous other poems, sketches in prose, and contributions to literary periodicals. His historical ballads are particularly popular. His poems have been collected by F. Ney (5 vols., Pesth, 1858). A selection of them has appeared in a German translation by Kertbeny (3d ed., Vienna, 1857).

GARCIA. I. Manuel de Popule Vicente, a Spanish composer, born in Seville, Jan. 21, 1775, died in Paris, June 9, 1832. Having acquired celebrity as a tenor singer in Spain, he made his début in Paris in 1808, and for many years was a reigning favorite. He wrote a number of operas, of which "The Caliph of Bagdad" proved the most successful. In 1825 he came to the United States with an opera troupe, including his wife and his daughter Maria Felicia, afterward celebrated as Mme. Malibran. The enterprise proved so successful that Garcia extended his visit to Mexico. On the road between Mexico and Vera Cruz he was robbed of all his earnings, and returned to Paris impoverished. His voice having been impaired, he established a school of vocal instruction. He was equally accomplished as an actor and a vocalist. **II. Manuel**, a musician, son of the preceding, born in Madrid in 1805. He accompanied his family in their travels, was a teacher of music in the Paris conservatory from 1835 to 1850, and afterward in London, and is one of the best teachers in Europe. He has written *Mémoire sur la voix humaine* (2d ed., 1847); *École de Garcia, traité complet de l'art du chant* (3d ed., 1851; remodelled in 1856 under the title of *Nouveau traité, &c.*); and *Observations physiologiques sur la voix humaine* (in French and English, 1855). (See MALIBRAN, and VIARDOT.)

GARCILASO (Garcias Lasso) DE LA VEGA. I. A Spanish lyric and pastoral poet, born in Toledo in 1508, died in Nice in November, 1538. His father was councillor of state to Ferdinand and Isabella, and his mother was the daughter of Fernan Perez de Guzman. At an early age Garcilaso entered the service of the emperor Charles V. He was in the campaign in the Milanese in 1521, and distinguished himself by his valor at the battle of Pavia in 1525. In 1530 he married Donna Helena de Zuñiga, an Aragonese lady; and in 1532 he followed Charles in his Hungarian campaign against the Turks. While at Vienna he incurred the displeasure of the empress by promoting the marriage of one of his nephews with a lady of the imperial household, and was imprisoned on an island in the Danube, where he wrote a poem contrasting his own desolate situation with the beauty of the surrounding scenery. He was soon released and taken into greater favor than

ever. In 1535 he accompanied the emperor on the expedition to Tunis, in which he was severely wounded; and in the succeeding year he followed him in the disastrous invasion of the south of France. In an attack upon a small castle on a hill near Fréjus, Garcilaso was struck on the head by a stone and fell into the ditch beneath. He was carried to Nice, where he died three weeks afterward. The emperor avenged the death of his favorite by hanging all the defenders of the castle. Garcilaso left an only son, who fell in battle against the Dutch in 1569. Garcilaso's poems were found by the widow of his friend the poet Boscan among her husband's papers, and published with them. They consist of 37 sonnets, 5 canciones, 2 elegies, an epistle in *versi sciolti*, and 3 pastorals. He is considered one of the finest poets of his nation, and is often designated as the Spanish Petrarch. The best edition of his poems was published in Madrid in 1766, edited by José Nicolas de Azara. The oldest edition known is that of Venice, 1558. There is an English translation, with a life and an essay on Spanish poetry, by J. H. Wiffen (London, 1823). **II. Sebastian**, a Spanish soldier, one of the conquerors of Peru, born in Badajoz, died in Cuzco in 1559. He was of the same family with the preceding, and went to Mexico with Pedro de Alvarado. After the invasion of the kingdom of Quito, and Alvarado's return to Guatemala, Garcilaso remained in Peru and attached himself to the fortunes of Francisco Pizarro, and after his death to those of his brother Gonzalo. In the decisive battle of Xaquixaguana, April 9, 1548, he rode over to the royal side at the turning point of the contest, was received with pardon and favor by the viceroy, and appointed governor of Cuzco, an office he held till his death. Garcilaso was noted for his humanity to the Indians, and for the efforts he made to ameliorate their condition. He married an Indian princess of the blood royal, the niece of Huayna Capac, and granddaughter of the renowned Tupac inca Yupanqui. **III. Surnamed the Inca**, a Spanish historian, son of the preceding, born in Cuzco about 1540, died in Cordova, Spain, about 1620. About 1560 he went to Spain, where he ever afterward resided. He entered the army, and served as a captain under Don John of Austria, in the war with the Moriscos. After the war ended he retired to Cordova, and devoted himself to literature. He began by translating the *Dialoghi di Amore*, by Leone Abravanel. This work was soon placed on the *Index Expurgatorius*. His *La Florida del Ynca* (Lisbon, 1605) is chiefly devoted to the adventures of Fernando de Soto. In 1609 he published the first part of his great work, *Comentarios reales, que tratan del origen de los Ynca reyes, que fueron del Perú* (Cordova, 1617; corrected ed., 17 vols., Madrid, 1800-'3), relating the history of Peru under the incas. Shortly before his death he finished the second part, comprising the story of the conquest by

the Spaniards. This work gives by far the fullest account of Peru under its native kings, and is in fact the source of almost all our knowledge upon the subject. The author was proud of his descent from the incas, and obtained much of the material for his history from his mother's family. His "Commentaries" are interesting and valuable, though they contain much that is mere gossip and not a little fable. They have been translated into many languages. An English translation, in 1 vol. fol., by Sir Paul Rycout, knight, was published at London in 1688, which, though containing numerous errors, is still a favorite with book collectors.

GARÇIN DE TASSY, Joseph Héliodore, a French orientalist, born in Marseilles, Jan. 20, 1794. He studied in Paris, and at the recommendation of his teacher, Sylvestre de Sacy, a new chair was established for him in the school of living oriental languages, which he continued to fill in 1873. His principal work is *Histoire de la littérature hindoue et hindoustani* (2 vols., 1837; new ed., 1878). A second edition of his *Budiments de la langue hindoustani* appeared in 1863, and a 4th edition of his *Poésies philosophiques et religieuses chez les Persans* in 1864.

GARD, a S. E. department of France, in Languedoc, bounded S. by the Mediterranean and E. by the Rhône, and by the departments of Hérault, Aveyron, Lozère, Ardèche, Vaucluse, and Bouches-du-Rhône; area, 2,256 sq. m.; pop. in 1872, 420,181. It derives its name from the small river Gard or Gardon, which rises in the Cévennes, runs through its centre, and falls into the Rhône a few miles N. of Beaucaire. The Cévennes mountains send ramifications to its centre, while in the southeast there is a considerable extent of level country, broken by pools and marshes. Iron, argentiferous lead, antimony, zinc, and manganese are mined; coal mines are also wrought, and there are valuable salt marshes on the coast. The arable lands, which comprise scarcely one fourth of the department, are generally poor, and agriculture is backward. The wines are highly esteemed, and olives are produced; but the culture of the mulberry is of paramount importance. Other fine fruits are also abundant. This department ranks among the most industrious in France, and is especially distinguished for its manufactures of silk, besides which it has cotton and woollen mills, tanneries, distilleries, and soap-making establishments. It is divided into the arrondissements of Nîmes, Alais, Uzès, and Le Vigan. Capital, Nîmes.

GARD, *Post du*. See *AQUEDUCT*, vol. i., p. 618.

GARDA, Lake (anc. *Benacus Lacus*), the largest of the Italian lakes, between the provinces of Brescia and Verona, and projecting at its N. and narrowest part into the Tyrol. It is 38 m. long from N. to S., from 3 to 11 m. broad, and 226 ft. above the sea; area about 150 sq. m. The Sarca and several smaller streams discharge themselves into it from the north; the

Mincio flows from its S. E. extremity. The lake is about 1,000 ft. deep in many places, the water is very pure, and it is noted for its fish, especially salmon trout and sardines, the latter being an important article of commerce. The surrounding hills are planted with vines, olives, and fig trees, and several handsome villages overlook the lake, among them Garda, Salò, and Maderno. The Tyrolese town of Riva is at the N. W., and the Italian fortress of Peschiera at the S. E. extremity.

GARDAIA, or *Chardela*, a town of Algeria, in the province of Algiers, situated in the oasis of the Beni Mzab, on the Wady Mzab, in the Sahara, about lat. 32° 30' N., lon. 4° E.; pop. about 60,000. It is well fortified, having a wall with battlements and nine large towers, each of which is capable of holding from 300 to 400 men. Ten gates give entrance to the town, which contains a mosque of vast size and five smaller ones, besides a Jewish synagogue. The chief administration rests with the French *bureaux arabes*; the details of it are left to the native chiefs, who are generally little more than the mouthpiece of the high priest, whose advice has all the force of law. A flourishing trade is carried on with Tunisia, Algiers, Bou Sada, &c., in corn, butter, groceries, oil, pottery, and negro slaves. The suburbs of the town contain extensive vineyards and orchards. Rain is almost unknown, but there are numerous wells, some of which are 900 ft. deep. On a neighboring eminence are the remains of a large tower supposed to have been built by the Romans. The oasis in which Gardaia is situated submitted to French rule in 1858.

GARDEN. See *HORTICULTURE*.

GARDEN, Alexander, a British physician and naturalist, born in Scotland in 1728, died in London in 1792. He studied philosophy in the university of Aberdeen, and medicine under Dr. John Gregory, and emigrated to South Carolina near the middle of the century. He acquired a fortune by the practice of medicine in Charleston, and a high reputation by his studies in botany and other sciences. In 1754 he declined a professorship in the college recently established in New York city. He was a correspondent of Linnæus, who gave the name of *Gardenia* to one of the most beautiful and fragrant of flowering shrubs. He published accounts of the pink root (*epigelia Marilandica*), of the *helesia*, of the cochineal insect, of the mud *iguana*, or siren of South Carolina, an amphibious animal, of two new species of tortoises, and of the *gymnotus electricus*.

GARDEN, Alexander, an officer of the American revolution, in Lee's famous legion, born in Charleston, S. C., Dec. 4, 1757, died there in 1829. He was for a time aide-de-camp to Gen. Greene. He wrote "Anecdotes of the Revolutionary War in America, with Sketches of Character of Persons the most distinguished in the Southern States for Civil and Military Services" (1st series, Charleston, 1822; 2d series, 1828), which is one of the authorities

for the history of the period. It was republished in 2 vols. 4to, Brooklyn, 1865.

GARDINER, a city of Kennebec co., Maine, on the W. bank of the Kennebec river, 10 m. below Augusta, at the head of summer navigation, and on both sides of the Cobscookscottee; pop. in 1870, 4,497. A bridge 900 ft. long connects it with Pittston on the opposite bank of the Kennebec; and the Augusta division of the Maine Central railroad passes through the city. It is largely engaged in manufactures, for which the falls of the Cobscookscottee afford great advantages, and it contains six saw, shingle, lath, and clapboard mills, three large paper mills, a woollen factory, two foundries, three machine shops, a tannery, an axe factory, three carriage factories, two manufactories of sashes and blinds, &c. Considerable shipping is owned here. There are two hotels, three national banks with an aggregate capital of \$250,000, a savings bank with \$1,050,000 capital, two weekly newspapers, 16 school houses (including a high school building), an almshouse, a mechanics' association with a small library, a public library, and nine churches.—Gardiner was settled in 1760, incorporated as a town in 1808, and as a city in 1850.

GARDINER, James, a Scottish soldier, born at Carriden, Linlithgowshire, Jan. 11, 1688, killed Sept. 21, 1745. At the age of 14 he obtained a commission in the Dutch service. He afterward entered the English army, and was present at the battle of Ramillies. In 1730 he was made lieutenant colonel, and in 1745 commanded a regiment at the battle of Prestonpans, where he was slain. His death is described in Scott's "Waverley." In his youth he led a dissipated and reckless life, but was, as he believed, converted through a supernatural vision, and became an exemplar of Christian piety and worth. His life was written by Dr. Doddridge.

GARDINER, Stephen, an English Roman Catholic prelate, born at Bury St. Edmund's in 1483, died Nov. 12, 1555. He was educated at Cambridge, became secretary of Wolsey, and was soon in high favor with Henry VIII. In 1527 he was sent to Italy to procure the pope's consent to the divorce of Queen Catharine. His mission proved unsuccessful, but while at Rome he rendered important services to Wolsey. On his return he was intrusted with the conduct of the divorce case, and successively made secretary of state and (in November, 1531) bishop of Winchester. He endeavored to convince the king of the impolicy of breaking with the pope, and of the propriety of punishing those who denied the bodily presence of Christ in the eucharist. The downfall of Cromwell, who had succeeded Wolsey as favorite, added for a time to the influence and power of Gardiner. But the king began at length to lean toward the reformers, and the refusal of Henry to permit the arrest of Catharine Parr for religious contumacy demonstrated the

decline of Gardiner's power. On the accession of Edward VI., Gardiner, refusing to approve of the articles and injunctions issued by the new council, was committed first to the Fleet prison, and then, after a short release and new provocation, to the tower, where he was confined till the reign of Mary, when he was restored to liberty and raised to still greater power than ever, being made lord chancellor. The Protestant persecution which took place during his administration has been generally ascribed by Protestant writers to his counsel, but, according to Lingard, "more from conjecture and prejudice than from real information." He is said to have exclaimed on his deathbed: *Erravi cum Petro, sed non flevi cum Petro* ("I have erred with Peter, but I have not wept with Peter").

GARDINER, L. Sylvester, an American physician, born in Kingston, R. I., in 1707, died in Newport, Aug. 8, 1786. He studied medicine in London and Paris, subsequently practised his profession in Boston, and opened there a drug establishment, from which the New England colonies were chiefly supplied. He was one of the early promoters of inoculation for the smallpox, and a liberal contributor for the erection of King's chapel, Boston. He became possessed of large tracts of land in Kennebec co., Me., and about the middle of the century was instrumental in establishing there the settlement of Pittston, a portion of which was subsequently set off into a separate town, under the name of Gardiner, where he built and endowed Christ church. He retired from Boston on its evacuation by the British troops, but returned to the United States at the close of the revolutionary war, and passed the rest of his life here. **II. John**, an American advocate, son of the preceding, born in Boston in 1731, drowned off Cape Ann in October, 1793. He studied law at the Inner Temple, London, and was admitted to practise in the courts at Westminster hall. He formed an intimacy with Churchill and Wilkes, and was junior counsel of the latter at his trial in 1764, and also appeared for Beardmore and Meredith, who for writings in support of Wilkes had been imprisoned on a general warrant. In 1766 he procured the appointment of attorney general in the island of St. Christopher, where he remained until after the American revolution, when he returned to Boston. After residing there a few years, he removed to Pownalborough, Me., which place he represented in the Massachusetts legislature until his death. As a legislator he distinguished himself by his efforts in favor of law reform, particularly the abolition of special pleading, and the repeal of the statutes against theatrical entertainments. In connection with the latter subject he published a "Dissertation on the Ancient Poetry of the Romans," and an accompanying speech. The abolition of the law of primogeniture in Massachusetts was due to his efforts. He was one of the most influential of the early Unit-

rians of Boston, and participated in the transformation of King's chapel from an Episcopal into a Unitarian Congregational church. **III. John Sylvester John**, an American clergyman, son of the preceding, born in Haverford West, South Wales, in June, 1775, died in Harrowgate, England, July 29, 1830. He accompanied his father to the West Indies, and subsequently studied in Boston, and in England under the celebrated Dr. Parr, with whom he remained six years. Returning to America, he was in 1787 ordained by Bishop Provoost of New York. In 1805 he became rector of Trinity church, the chief Episcopal parish in Boston. He wrote the "Jacobiniad," a satire on the republican clubs of Boston.

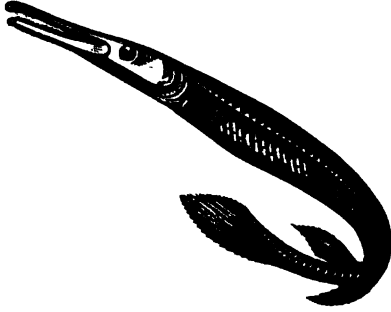
GARDONI, Itale, an Italian vocalist, born in 1820. He first appeared at the opera of Paris in 1844 as Earl Bothwell in *Maria Stuart*, and was applauded as almost equal to Mario, both in the sympathetic effect of his tenor voice and in his graceful and handsome person. In 1845 he won new laurels as Don Sanche in Balfe's *Étoile de Séville*, and in 1846 in Flotow's *Amé en peine*.

GARFIELD, James Abram. See supplement.

GAR FISH, or **Gar Pike** (*lepidosteus*), a ganoid fish, belonging to the same order as the *polypterus* of Africa, the mud fish (*amia*) of America, and the sturgeon family; it is the only genus of its family, and there are more than 20 species, all American. As in other ganoids, the body is covered with smooth enamelled scales, of a rhombic form, arranged in oblique rows, and so hard that it is impossible to pierce them with a spear; this enamel is like that of teeth, and the scales contain the fluorine and lacunæ of ordinary bone structure. The internal skeleton is bony; the snout is elongated, varying in width according to the species; both jaws and nasal bone are covered with small teeth, with long and pointed ones along the edge; the teeth are in double rows of unequal size, the larger resembling those of reptiles, and the smaller fish-like, the front ones of the lower jaw being received into sheath-like cavities in the upper, as in the alligators; their structure resembles that of the labyrinthodont reptiles, having processes of the pulp cavity radiating toward the circumference; the vertebrae also present a reptilian arrangement in having ball-and-socket articulations, the anterior surface of each bone being convex and the posterior concave; this gives greater flexibility to the spine, and enables this genus (alone among fishes) to move the head independently of the trunk, and also to retain the posterior part of the body in a curved position. The gills on the four arches have a perfect bifoliate structure, and behind the last and the hyoid bone there is the usual fissure; there is a respiratory opercular gill as well as a pseudobranchia, but no blow-hole; branchiostegal rays three, the membrane passing from side to side, undivided. The anterior edge of all the fins is protected by hard spiny scales, and all the fin rays are

articulated; the dorsal and anal fins are far back, and nearly opposite one another; the caudal fin is abruptly truncated, and its rays are inserted partly at the end of and partly beneath the extremity of the spine. There are the usual numerous valves in the arterial bulb, no decussation of the optic nerves, and abdominal ventral fins; the stomach is continued without cæca to a slender twice-folded intestine, which has a slightly developed spiral valve, but numerous pancreatic cæca; the long air or swim bladder is muscular, freely supplied with blood from the aorta, divided into cells like the lung of a reptile by muscular bundles, and opening into the throat by a wide duct and long slit guarded by a sphincter muscle; the ovaries are saciform, with oviducts issuing from their middle. Gar fish are not uncommon in the western rivers and northern lakes communicating with the gulf of Mexico and the St. Lawrence, and probably every separate basin and watershed has its peculiar species. They frequent shallow, reedy, or grassy places, basking in the sun like the pike, and devouring living prey with great voracity. The manner of seizing prey differs from that usually observed in fishes, and resembles that of reptiles; instead of taking their food at once with open mouth and swallowing it immediately, they approach it slyly and sideways, and then, suddenly seizing the fish or other animal, hold it until by a series of movements it is placed in a proper position for being swallowed, in the manner of alligators and lizards; the ball of food is also seen to distend the body as it passes downward, as in snakes. This reptilian fish, like the ichthyoid reptiles, is in the habit of approaching the surface of the water, and of apparently swallowing air; at any rate, a large amount of air escapes from the mouth, most of which had probably been previously swallowed, and a part of which may have been secreted by the lung-like air bladder. As in the *menobranchius* and other fish-like salamanders, this air bladder doubtless performs certain respiratory functions, and perhaps more than in the naked-skinned reptiles; at any rate gar pikes live longer out of water than fishes generally, and to a degree not explicable by any arrangement of the gills. The gar pike and the African *polypterus* (described below) are the only two existing genera of a type of sauroid fishes which were very numerous in the secondary geological epoch, extending also in diminished numbers through the palæozoic age at a time when reptiles proper did not exist; they are found from the lower Silurian strata to the present time, gradually diminishing through the tertiary to the two existing genera; they present one of the first steps in the geological succession of bony fishes, at a time when the stenoids and cycloids had not appeared; after the rhizodont reptiles and the common osseous fishes were created, the ganoids began to diminish.—The common gar fish (*L. osserus*, Linn.), called also bony

pike and Buffalo fish, attains a length of 5 ft. The color is umber brown on the back and head, the sides yellow, and the belly white; there are circular black spots on the caudal, dorsal, and anal fins. It is found in Lakes Erie, Huron, and Champlain, the Ohio and its



Gar Fish, or Gar Pike (*Lepidosteus osseus*).

tributaries, and other western rivers. The great length of its jaws will distinguish it from other species; it is often seen apparently sleeping on the surface, and gently carried round in an eddy for an hour at a time; it leaps often out of water in pursuit of its prey, and is so swift and strong a swimmer as to stem the most furious rapids. The alligator gar fish (*L. ferox*, Raf.) has a shorter head, the jaws forming not quite half the length, broad and flat above; the skin is rough, the scales imbricated and sculptured; teeth numerous, strong, and prominent; the upper jaw, as in the preceding species, expanding into a knob at the end; the color is yellowish brown. It inhabits the Mississippi and Ohio rivers and their tributaries, and is usually from 4 to 6 ft. long; according to Rafinesque, it attains a length of 12 ft., and is a match for an alligator; its impervious coat of mail, strong teeth, size, strength, and agility must make it a very formidable fish, though probably not superior to the equally well armed and powerful alligator. It may well be called the shark of fresh water, though not belonging to the placoid group of fishes. There are several other species described, more or less resembling the above; but these will serve to give an idea of the general characters of this singular fish, the living type of the dominant family of its class during the carboniferous period.—The allied genus *polypterus* (Geoffr.), from the Nile, Senegal, and other African rivers, is characterized by similar enamelled scales, and by a number of finlets extending from the middle of the body to the tail; the throat is covered with hard, nearly immovable plates, which would greatly embarrass respiration were it not for two openings on the top of the head, which answer the purpose of blow-holes and allow the water to pass through them; the lobes of the tail are of unequal size; the abdominal organs occupy a very small space, being packed close to the spine;

the upper jaw is not in several pieces, but the mandibles and skull are as in osseous fishes generally; there is no opercular gill, nor pseudo-branchia; the nostrils are very complicated, with labyrinthine gill-like folds; the stomach is caecal, the intestine provided with a well marked spiral valve, and there is a single pancreatic caecum; the air bladder is double, communicating with the throat by a duct opening on the ventral side, and its arteries are formed by the union of the blood vessels coming from the last gill, carrying therefore oxygenated blood.—The *lepidosteus* is by far the best known and most interesting of the sauroid fishes, and has been of such value to palaeontologists that it has been well said by Hugh Miller, in his "Lectures on Geology," that "it would almost seem as if the *lepidosteus* had been spared, amid the wreck of genera and species, to serve us as a key by which to unlock the marvels of the ichthyology of those remote periods of geologic history appropriated to the dynasty of the fish." (See *GANOIDS*.)

GARGANO, Monte (anc. *Garganus Mons*). See *APENNINES*.

GARIBALDI, Giuseppe, an Italian patriot, born in Nice, July 4, 1807. His father educated him to his own profession, that of a mariner. His second voyage was to Rome, when the condition of that city made a deep impression on his mind, and led him into those revolutionary views which, in February, 1834, resulted in his exile from Italy. He first went to Marseilles, whence he made voyages to various ports. He made one to the Black sea, passing Constantinople, where he had some years before spent a short time, and another to Tunis, and from there sailed for Rio de Janeiro. At Rio he met Rosetti, with whom he entered into an unsuccessful commercial partnership. About this time Zambeccari arrived there from Rio Grande, which had declared her independence; becoming acquainted with Garibaldi and Rosetti, he persuaded them to espouse the cause of that republic, and Garibaldi, with 20 companions under his command, embarked in a small craft which he named the *Mazzini*. In an engagement with two launches, which he beat off, he received a gunshot wound in the neck, which nearly proved fatal. He landed at Gualagay on neutral soil, where he was treated to a certain extent as a prisoner, being prohibited from moving more than a short distance from the town. He endeavored to escape, but was retaken, brought back, and tortured nearly to death with the view of extorting from him the names of those who had favored his flight. Two months later he contrived to reach Montevideo, where he found Rosetti, and the two returned to Rio Grande and joined a land expedition, under Bento Gonzalez, president of the republic, against the Brazilians who were infesting the neighborhood of Piratimin. Until the end of the war he was employed in the service of the short-lived republic, chiefly at sea, though sometimes

on land. Prior to the cessation of hostilities Garibaldi married a South American woman, who, until her death in 1849, was the companion of all his dangers and privations by sea and land. After the war he settled in Montevideo and taught mathematics, till Rosas, the dictator of Buenos Ayres, declared war against Uruguay. The commencement of the war was disastrous; Montevideo was besieged, and the minister of war Vidal robbed the treasury and fled. Garibaldi organized a flotilla, and recommended the formation of an Italian legion, which, though especially charged with the defence by sea, he frequently commanded. Montevideo was saved. In the spring of 1848 Garibaldi sailed from South America with a portion of the Italian legion, and on arriving in Piedmont placed himself at the disposal of Charles Albert, by whom he was coldly received. The king being defeated a few days later, Garibaldi with a few resolute republicans prolonged the resistance until forced across the frontier by a superior Austrian detachment. He crossed the Po, and reached Ravenna, but papal troops were ordered against him. On the flight of the pope the new executive gave Garibaldi a command, sending him to watch the Neapolitan frontier near Rieti, where he remained till the spring of 1849, when Avezzana, the new minister of war, called him to Rome. The French expedition to restore the pope having appeared before Rome on April 30, Garibaldi was, with 1,200 men, posted in some villas outside the gates. Notwithstanding the great disparity of numbers, he attacked the right wing of the French, when Avezzana, who commanded in chief, seeing from the city wall the peril of the Italians, despatched 1,500 men to his succor. Garibaldi then charged the French, put them to flight, pursued them several miles, and returned with 300 prisoners. The Neapolitans now threatened Rome, and were beaten by Garibaldi at Palestrina and at Velletri. The French, strongly reinforced, having on June 30 gained a footing inside the wall, the resistance soon became hopeless, and the republican triumvirate, Mazzini, Saffi, and Armellini, abdicated. Garibaldi, whose men fought bravely to the last, resolved to continue the struggle in the open country. He left Rome to try to penetrate to Venice with about 4,000 men, of whom 800 were mounted, and marching by Tivoli to Terni met the second Italian legion, which was awaiting him. The enemy, in immensely superior numbers, never accepted a general engagement; Garibaldi so adroitly manœuvring as to extricate himself and leave his enemy behind him every time he appeared to be surrounded. On July 30 he reached San Marino, his force being reduced to 1,800 men, and there he found in his front a fresh Austrian army in addition to the 18,000 pressing on his rear. Terms were now offered, to the effect that there should be a general amnesty and all should return home, the arms being surrendered

to the republic of San Marino. Such conditions would have been accepted had a few French belonging to the second legion been permitted to return to Switzerland; but as it was insisted that they should be sent to Rome, the offer of the Austrians was rejected, and at night about half the force (the rest chose to surrender) made their way toward Cesena; and though vigorously pursued, the remnant, 290 in number, embarked from Cesenatico in some fishing boats on Aug. 2. Toward nightfall they were descried by the Austrian fleet; some were captured, and the rest scattered. In the boat with Garibaldi were his wife and a few of the most compromised; these gained the shore and dispersed in twos and threes. Two days later Anna Garibaldi, who had refused to leave her husband, being worn out by fatigue, died. Garibaldi made his way from the east to the west coast, while the punishment of death was decreed for whosoever gave him bread, water, or shelter. At Chiavari he was arrested and conducted to Genoa. Banished from Sardinia, he arrived at New York in the summer of 1850, declined a public reception offered him, and earned a living by making candles in a manufactory on Staten Island till an opportunity occurred of resuming the occupation of a mariner. He made some voyages in the Pacific, and in about three years returned to New York in command of a Peruvian bark. Having lost his mother, to whom he had confided the care of his three children, he accepted an invitation to return to Nice, where he lived in retirement. In the beginning of 1859, on the breaking out of the war with Austria, he was invited by the Sardinian government to form a corps, which became celebrated as the "Hunters of the Alps" (*Cacciatori delle Alpi*). Detached from the rest of the army, he crossed into northern Lombardy with a small force, beat several Austrian detachments, and rendered important services to the Italian cause throughout the war. In May, 1860, with about 1,000 volunteers, he sailed from Genoa for Sicily, landed at Marsala, took Palermo and Messina, and became dictator of the island. He then crossed the strait, in September entered Naples, won a victory on the Volturno, and was joined by the Sardinian army, which had advanced from the north, and completed the overthrow of King Francis. The kingdom of the Two Sicilies was now merged in that of Italy, Garibaldi resigning the dictatorship and retiring to the small island of Caprera. In 1861 he was elected a member of the chamber of deputies. In April, 1862, he was appointed general-in-chief of the national guard. While he was engaged in enlisting volunteers, he published on July 26 an appeal to the Hungarians to rise against Austria. This brought him into collision with his own government; several of his officers and men were arrested and disarmed, and he retired to Caprera and began to plan for an attack on Rome. Napoleon III. sent vessels to blockade the Sicilian coast to

prevent Garibaldi from passing to the mainland. He however succeeded in crossing with a force of about 2,200 men, nearly all of whom were captured, Aug. 28, near Aspromonte, where Garibaldi was seriously wounded and made a prisoner. He was released in October, and was permitted to return to his island. He retired from the chamber of deputies in January, 1864. In 1866 he commanded a corps of volunteers against the Austrians, and engaged in some operations in the Tyrol; but the war was brought to a close before he had much opportunity to distinguish himself, and he returned to Caprera. In 1867 he organized another army for the conquest of Rome, but the government resolving to suppress the movement, Garibaldi was arrested, and, after a short detention as a prisoner, was sent to Caprera, where he was watched by a ship of war to prevent his escape to the mainland. This watch he evaded, and in October he was again in Florence. A week after he joined the insurgents on the Roman frontier. Four days later (Oct. 26) he defeated the papal troops at Monte Rotondo; but on Nov. 8 he was defeated by the French and papal forces at Mentana. On his way back to Caprera he was arrested and imprisoned. His protest as an Italian deputy and an American citizen effected his release after a few weeks. From this time for a considerable period he lived in retirement in his island home. In October, 1870, on the establishment of the French republic, he arrived in Tours, and offered his services to the government of the national defence. On the 16th he was made a general of division in the French army and placed in command of the irregular forces in the Vosges; but he had little opportunity to distinguish himself in the field. In February, 1871, he was elected for Paris and several departments as deputy to the national assembly; but at the preliminary meeting of that body at Bordeaux on the 12th, he resigned his seat and his command in the army, and returned to Caprera. Garibaldi has appeared as a novelist in *Cantoni il volontario* (1870), and in *Clelia, ovvero il governo monaco: Roma del secolo XIX.* (1870). The latter has been translated into English, under the title "Rule of the Monk, or Rome in the 19th Century" (1870). In 1878 he published a poem, *I mille di Marsala*.—See his "Autobiography," edited by Alexandre Dumas, translated into English by W. Robson (London, 1860); "Life of Gen. Garibaldi, written by Himself, with Sketches of his Companions in Arms," translated by Theodore Dwight (New York, 1860); and "Garibaldi at Caprera," by Col. Vecchi, with a preface by Mrs. Gaskell (London, 1862).—MENOTTI, one of his sons, took an important part in the Italian movements. At Aspromonte, Aug. 28, 1862, he as well as his father was wounded, and both were carried as prisoners to Spezia, but were soon released. In 1867, during the march on Rome, he commanded the Garibaldians in the absence

of his father. He went with him to France in 1870, and like him received a French command; but his action during the Franco-German war was comparatively unimportant.—RICCIOTTI, a younger son, who had also served under his father in Italy, was perhaps more successful than either his father or brother during the war of 1870-'71. He made a successful attack on the German garrison of Châtillon-sur-Seine, Nov. 19, 1870, and, in conducting operations under his father's command, gave evidence of considerable military talent.

GARLAND, a county of Arkansas. See HOT SPRINGS.

GARLIC, the bulb of the *allium sativum*, a plant of the same genus as the onion (*A. cepa*) and the leek (*A. porrum*). The plant is perennial, and grows wild in the southern parts of Europe, but its native place is not certainly known. In most countries it is cultivated, and has been esteemed from the remotest times as an article of food or as a condiment. The plant has flat leaves, somewhat like those of the leek, and at the base a bulb which is made up of five or six bulblets, called "cloves," which are of an oblong shape, flattened, and pointed at the apex; they are enclosed in numerous layers of thin, papery skin, which is usually white, but in one of the garden varieties rose-colored. The flower stem is about 18 inches high, and bears an umbel of pink or purplish flowers, which are often intermixed with small bulbs. The bulbs are taken up attached to the stem, and when dried in the sun are tied together in bunches like onions. Garlic has a strong peculiar odor called alliaceous, and a bitter and acrid taste. A highly viscid juice may be expressed from it, so tenacious that when dried it makes a cement for porcelain. By distilling the bulbs with water a very volatile essential oil is obtained, which possesses in a high degree the peculiar properties of the bulbs. It is of so acrid a nature that it will even raise blisters upon the skin. Sulphur is detected in this oil, combined with a radical called allyle, consisting of C_3H_5 . When garlic is used as food or medicine, and even when applied externally, this oil is rapidly absorbed, and its presence is soon perceived in the breath and in the secretions of the body. Its moderate use is thought to be beneficial for its stimulant properties in quickening the circulation, exciting the nervous system, &c. As a medicine it is most employed in external applications, as a sedative in fevers, and in nervous and spasmodic disorders of children.—A number of species of *allium* are indigenous to this country, and are known as wild garlic and wild leek; one (*A. vineale*), introduced from Europe, is now thoroughly naturalized in the older states, and is a troublesome weed. It grows frequently in pastures, and imparts a most disagreeable odor to the milk and butter from the animals that eat it; when it occurs in wheat fields it seriously injures the flour unless the grain is cleaned with great care. *A. moly*,

called garden garlic, has long been cultivated as an ornamental plant. It bears an umbel of large golden yellow flowers about a foot high; its treatment is the same as that of tulips and other spring-flowering bulbs.

GARNEAU, François Xavier, a Canadian historian, born in Quebec, June 15, 1809, died Feb. 3, 1866. He was admitted as a notary in 1830, and became clerk of the legislative assembly, member of the council of public instruction, and city clerk of Quebec, holding the last named office from about 1845 till his death. His *Histoire du Canada depuis sa découverte jusqu'à nos jours* (3 vols. 8vo, Quebec, 1845-'6; 3d ed., 1859) has been translated into English. He also published a volume of travels in England and France.

GARNET, the name of a mineral species, presenting many varieties; also applied by Dana to designate a section of the silicates; and in geology it is the name of a rock made up of some variety of the mineral. The garnet is supposed to have been sometimes included by the ancients in their names *carbunculus* and *hyacinthus*. In its more perfect forms it is a gem, and when cut and polished bears some resemblance to the ruby in color, transparency, and lustre. Some of the precious varieties are distinguished by the names Syrian and oriental, and also almandine, from Alabanda, the place where in the time of Pliny they were cut and polished. These and the black varieties also have been much used in Europe, strung together like beads for necklaces. Those most esteemed in jewelry are obtained from Ceylon, Pegu, and Greenland. A single crystal of only $8\frac{1}{2}$ lines by $6\frac{1}{2}$ has been sold for about \$700. Its crystals are rhomboidal and trapezoidal dodecahedrons and variously modified forms. Its hardness is from 6.5 to 7.5; specific gravity 3.15 to 4.3. It is met with of various colors, as red, brown, black, yellow, white, and green, and with a vitreous or resinous lustre. According to its composition it has been divided into six sub-species, all of which pass into one another by insensible shades of difference; they are all silicates of different protoxides or peroxides; as: 1, the alumina-lime garnet, a silicate of alumina and lime, of which the cinnamon stone or essonite is an example; 2, the alumina-magnesia garnet; 3, the alumina-iron garnet, a silicate of the protoxide of iron and lime, as almandine and a variety of the common garnet; 4, alumina-manganese garnet, called also manganesian garnet; 5, iron-lime garnet, composed of silicates of the peroxide of iron and of lime, as the black garnet and a variety of the common garnet; 6, lime-chrome garnet, as the emerald-green ouvarovite of Russia. The silicic acid in these varies from 34 to 44 per cent. Their composition is represented by the general formula $3RO, R_2O_3, 3SiO_2$, in which RO represents either one of the protoxides that may be present, and R_2O_3 either the alumina (Al_2O_3), or the peroxide of iron (Fe_2O_3), or of chrome (Cr_2O_3). According

to Odling, the formula is $R_2V_2SiO_4$, in which $R=Ca, Mg, Fe, \text{ or } Mn$, and $V=Fe, Al, \text{ or } Mn$. Garnets are easily melted by the blowpipe; and some varieties, as the melanite or black garnet found in the lavas of Vesuvius, appear to be a direct product of the fusion of their ingredients. The iron-lime garnets, of which this is a variety, containing from 20 to 80 per cent. of peroxide of iron, and about the same proportion of lime, might be advantageously employed both as iron ore and flux in the manufacture of iron, mixed with other ores more rich in iron and deficient in silica. They frequently occur in the vicinity of iron ores, and in beds of great extent, forming a true garnet rock, and from their highly ferruginous appearance have in some instances been mistaken for iron ores.—Crystals of garnet are common in the granite rocks and the metamorphic slates and limestones in almost all localities where these are found; but when most abundant and large, they are commonly rough and unsightly. In the gold region they abound in the slates, and in some instances where the rock that contained them has crumbled away they are left loose upon the surface, so that they might easily be shovelled up by cart loads.

GARNIER, Adolphe, a French eclectic philosopher, born in Paris, March 27, 1801, died in May, 1864. He aided Jouffroy in translating the works of Thomas Reid, was in 1827 appointed professor of philosophy in the college at Versailles, and afterward promoted to a chair in Paris. He meanwhile published his *Précis de psychologie*, and a complete edition of the philosophical writings of Descartes. In 1838 he succeeded Jouffroy as lecturer on philosophy at the Sorbonne, and in the following year produced his *Comparaison de la psychologie et de la phrénologie*. He published in 1850 a *Traité de morale sociale*, and in 1853 a *Traité des facultés de l'âme*, which won a prize from the French academy. His last work, *De la morale dans l'antiquité*, was published in 1865, with an introduction by Prévost-Paradol.

GARNIER, Charles Georges Thomas, a French author, born in Auxerre, Sept. 21, 1746, died there, Jan. 24, 1795. He was educated at the college of Plessis, and became an advocate, though the weakness of his voice did not permit him to speak in public. In 1770 he began to publish in the *Mercure de France*, under the nom de plume of "Mademoiselle Rainger de Malfontaine," dramatic proverbs, whose ingenuity and sprightliness attracted the attention of the governess of the young princess de Condé, and Garnier was soon engaged to write proverbs to be acted for the special amusement of the princess at the abbey of Panthemont. In 1791 he was made *commissaire du roi* at Paris, and in 1793 was sent by the revolutionary government to his native city as commissioner, which post he held till his death. Among his works are *Nouveaux proverbes dramatiques* (8vo, Paris, 1784), and various novels. He also collected and edited the *Cabinet des*

fées (41 vols. 8vo, Paris, 1785) and *Voyages imaginaires, songes, visions et romans merveilleux* (39 vols. 8vo, Paris, 1787).

GARNIER, Jean Louis Charles, a French architect, born in Paris, Nov. 6, 1825. He entered the school of fine arts in 1842, and studied under MM. Lévêil and Hippolyte Lebas. He took the grand prize in 1848, and continued his studies in Italy and Greece. In 1859, his designs having been twice preferred in competition with the most distinguished architects in France, he was appointed architect of the new opera house in Paris. He has published a volume of miscellanies entitled *A travers les arts* (1869).

GARNIER-PAGÈS, Louis Antoine, a French politician, born in Marseilles, July 18, 1803, died Nov. 1, 1878. While employed as a merchandise broker in Paris he attended the sittings of the secret associations which aided in the revolution of July, 1830, and in which his brother Étienne Joseph Louis (1801-'41) acted an important part. In 1842 he was elected to the chamber of deputies, and became at once one of the staunchest members of the opposition, and in 1847 was one of the most active promoters of the reform agitation. He was conspicuous among those who in February, 1848, appeared at the banquet of Paris, in spite of the prohibition of the government. On Feb. 24 he was appointed a member of the provisional government, then mayor of Paris, and on March 5 he succeeded M. Goudchaux as minister of finance. He decreed as such the unpopular additional tax of 45 centimes, which greatly contributed toward the overthrow of the republic. As a member of the constituent assembly, he submitted a remarkable report on the financial situation, and in May left the finance department to enter the executive commission of five appointed by the assembly. On the insurrection of June this commission had to resign its power to Gen. Cavaignac; and Garnier-Pagès, after the expiration of his term as deputy, rendered unpopular by the tax of 45 centimes, was not reelected. The democratic party nominated him again in 1857, but he was defeated by Émile Ollivier. In 1864 he became a member of the corps législatif, and devoted his labors specially to questions of finance and foreign relations. At the downfall of the empire in 1870 he was one of the deputies sent to the hôtel de ville, and was installed a member of the government of national defence. At the elections of Feb. 8, 1871, he failed to gain a seat, and retired to private life. He published *Un épisode de la révolution de 1848, l'impôt des 45 centimes* (1850); *Histoire de la révolution de 1848* (8 vols. 8vo, 1860-'62); a continuation, entitled *L'Histoire de la commission exécutive* (Paris, 1869); and in December, 1878, the completion of the work.

GARONNE (anc. *Garumna*), a river of S. France, which derives its name from its two head streams, the Gar, which rises in the

Spanish valley of Aran, and the Onne, which descends from the glaciers of Aô in the Pyrenees. Flowing N. W., it enters France at a place called Pont-du-Roi, in the department of Haute-Garonne. It runs thence N. E. to Toulouse, whence it flows generally N. W. It passes the towns of St. Bât, Montrejeau, St. Martory, Cazères (where it becomes navigable), Carbonne, Muret, Toulouse, Verdun, Agen, Marmande, and Bordeaux, a few miles below which it is joined by the Dordogne and forms the estuary or river known as the Gironde. Its chief affluents on the right bank are the Ariège, Tarn, and Lot; on the left, the Save, Gimone, Gers, Baise, and Ciron. Its length, including the Gironde, is about 360 m., of which 260 are navigable; but including its feeders, which communicate with 12 departments, the total river navigation of its basin is about 1,000 m. Large vessels ascend to Bordeaux, where it forms a large basin. At Toulouse it is joined by the canal du Midi, by means of which and by this river the Mediterranean is connected with the bay of Biscay. The basin of the Garonne includes a tract of country about 185 m. in average length and breadth. The upper part of its course lies through narrow defiles and is much obstructed; from Toulouse it is broad but shallow, and navigation is more or less impeded by the débris which it brings down as far as Marmande, about 50 m. above Bordeaux. Its banks are fertile and picturesque.

GARONNE, Haute. See HAUTE-GARONNE.

GARRARD, a central county of Kentucky, bounded N. by the Kentucky river and W. by Dick's river; area, 250 sq. m.; pop. in 1870, 10,876, of whom 3,404 were colored. It has a hilly or rolling surface, and a fertile soil. The chief productions in 1870 were 88,830 bushels of wheat, 25,207 of rye, 578,887 of Indian corn, 84,456 of oats, 86,842 lbs. of butter, and 32,115 of tobacco. There were 3,185 horses, 1,442 mules and asses, 7,605 cattle, 4,410 sheep, and 16,513 swine; 6 carriage factories, and 4 distilleries. Capital, Lancaster.

GARRETT, the W. county of Maryland, bordering on Pennsylvania and West Virginia, from which it is separated on the S. by the Potomac river, formed in 1872 from Allegany co.; area, 690 sq. m.; pop. in 1872, 10,857. It is watered by the Youghiogheny and affluents of the Potomac. The surface is very mountainous, and is covered with extensive forests. Bituminous coal, iron ore, limestone suitable for the manufacture of cement, and fire-brick clay abound. The high glade lands are suitable for pasture, and are productive of hay, grain, and potatoes. The county is traversed by the Baltimore and Ohio railroad. Capital, Oakland.

GARRETT, Elizabeth, an English physician, born in London in 1837. She began to study medicine at Middlesex hospital in 1860, and after perfecting her knowledge at St. Andrew's, Edinburgh, and the London hospital, she re-

ceived the diploma of L. S. A. in 1865, and the degree of M. D. was granted to her in 1870 by the university of Paris. She acquired a considerable practice in London as a physician for women and children, and also became known as a writer on medical and social questions, and as an advocate of woman's rights. She was general medical attendant of St. Mary's dispensary from 1866 to 1870, when she became a visiting physician of the East London hospital for children and dispensary for women. At the first election of members of the metropolitan school board under the new education act, at the close of 1870, she received in the district of Marylebone upward of 40,000 votes, being 20,000 votes more than any other candidate in any other part of London. Among the other successful candidates were Miss Davies, Prof. Huxley, and Lord Lawrence. Since her marriage with Mr. Anderson in 1871 she has been known as Dr. Anderson-Garrett.

GARRETTSON, Freeborn, an American clergyman, born in Maryland in 1752, died in New York, Sept. 26, 1827. He entered the Methodist ministry in 1775, travelled extensively in several of the states, and in 1784 went as a missionary to Nova Scotia. In 1788 he commenced his labors in the state of New York. In 1791 he married Miss Livingston of Rhinebeck, and confined his subsequent labors to New York, where he was eminently successful. He was a very popular preacher, and emancipated a number of slaves. At his death he made provision in his will for the perpetual support of a missionary.

GARRICK, David, an English actor, born in Hereford, Feb. 20, 1716, died in London, Jan. 20, 1779. His grandfather Garric, or Garrigue, was a French Protestant who took refuge in England after the revocation of the edict of Nantes. His father, a captain in the English army, settled at Lichfield on half pay, and with difficulty maintained a family of seven children. At the age of 10 David was sent to a grammar school. He was a great mimic, and at 11 acted before a select audience with great applause. He was manager of the company, and applied to Johnson for a prologue, but without success. In 1728 or '29 he went to Lisbon to visit an uncle, a considerable wine merchant, where he amused dinner parties by repeating verses and popular speeches. He returned the next year to England, and attended the theatres at London during occasional visits there. At 18 he was one of the three scholars at Dr. Johnson's academy. In March, 1736, he set out with his master for London. Johnson and Garrick entered the metropolis with little money and a single letter of introduction. Garrick began to study law, but poverty interrupted his course. His uncle soon after died, leaving him £1,000, and he next commenced business as a wine merchant, in connection with his brother, but the partnership was soon dissolved. He was now constant at the theatres, wrote theatrical criticisms, practised declamation, and in the

summer of 1741 made his first appearance as an actor at Ipswich, under the assumed name of Lyddal, taking the part of Aboan in the play of "Oroonoko." His face was blackened, and he trembled with diffidence; but the provincial audience was delighted. He soon tried comic parts, and as Harlequin his success was complete. But when he applied for employment to the managers of Drury Lane and Covent Garden, both rejected him. He made his first appearance in London at a little playhouse in Goodman's fields, Oct. 19, 1741, acting Richard III. with great effect. His fame spread rapidly; the great theatres were deserted, and all the fashion came to Goodman's fields. He next made an engagement at Drury Lane for £500 a year. In 1742 he went to Dublin, and was received with great enthusiasm. In 1749 he gained the friendship of Pitt, afterward earl of Chatham, and of Lyttelton. Pitt wrote him complimentary verses, and Lyttelton praised him in his "Dialogues of the Dead." Garrick was now the first of English actors; he excelled in comedy, farce, tragedy, and pantomime. In 1745 he again visited Dublin, and was for a time joint manager there with Sheridan. In 1747 he bought a half interest in Drury Lane theatre, and on Sept. 20 opened his management with the famous prologue written by Johnson. He soon after brought out Johnson's "Irene" with considerable profit to the author. In 1749 Garrick married the German dancer Mlle. Violette, who is said to have brought him £6,000. She was accomplished, intelligent, and a faithful wife, and survived him till 1822, when she died suddenly at the age of 98. In 1758 Garrick brought out "The Gamester," by Edwin Moore; he refused Home's "Douglas" in 1756. He was singularly sensitive, trembled before adverse criticism, and assiduously courted the critics. In September, 1763, he went to the continent, and was received everywhere with attention and respect. He returned in 1765, and in November reappeared in "Much Ado about Nothing," at the command of the king, amid unbounded applause, having opened the performance with an address to the public which was called for on the ten succeeding nights. In September, 1769, he arranged a jubilee in honor of Shakespeare at Stratford-on-Avon, which continued three days, and which he afterward represented for 92 successive nights at Drury Lane. In 1773, his partner, Mr. Lacy, having died, the whole management of the theatre fell to his charge. His health failing, he now seldom acted; and on June 10, 1776, after having played a round of his old and favorite characters, he took his leave of the stage in the part of Don Felix, in the comedy of "The Wonder," the performance being for the benefit of the fund for the relief of decayed actors, which he had originated. Having amassed a very considerable fortune, he now retired to enjoy it. His villa at Hampton was adorned with all the charms of luxury and taste. Bishops and

princes visited the retired actor, and Hannah More here passed many agreeable hours. His later years were filled with suffering. The gout and gravel, to which he had long been subject, returned upon him with increasing severity. He was buried on Feb. 1, 1779, beneath the monument of Shakespeare. His talents were singularly versatile. He wrote farces and comic pieces, conversed well, and was a member of the literary club. He succeeded in every kind of acting. His comic turn led him to delight in broad farces, in feats of dexterity, and ludicrous transformations. As Hamlet he filled his audience with horror and melancholy; as Lear he rose to the height of tragic power. He was of middle size, delicate in form, and quick in movement, wanting that dignity of appearance which has distinguished so many other actors. His memory, too, sometimes failed him, and he would repeat a line before he could recover himself. But his voice was melodious and clear, his countenance animated, and his sensitive temperament, even in his silence, governed the spectator. His thrills of feeling communicated themselves by look, gesture, and position. He was somewhat vain, but good-humored and placable, and a kind friend. In spite of a certain want of dignity in his manners, and a constant affectation, he was respected and liked.—See "Life of Garrick," by P. Fitzgerald (2 vols., London, 1868).

GARRISON, William Lloyd, an American abolitionist, born in Newburyport, Mass., Dec. 12, 1804. His parents were natives of the province of New Brunswick. His father, Abijah Garrison, was master of a vessel engaged in the West India trade, and a man of some literary ability and taste; but he became intemperate, and abandoned his family while his children were young. The mother, left in utter poverty, became a professional nurse, and in 1814 went to Lynn. William was at first apprenticed to a shoemaker, but afterward sent to school at Newburyport, partly supporting himself by aiding a wood sawyer. In 1815 he went with his mother to Baltimore, where he remained a year in the capacity of an errand boy, and then returned to Newburyport. In 1818 he was indentured to Ephraim W. Allen, editor of the "Newburyport Herald," to learn the art of printing, and when only 16 or 17 years of age began to write upon political and other topics for the "Herald," carefully preserving his incognito, and once received through the post office a letter of thanks from his master, with a request that he would continue to write. He soon commenced writing also for other journals, and a series of articles which he wrote for the "Salem Gazette," under the signature of "Aristides," attracted much attention in political circles. In 1826 he became the proprietor and editor of a journal in his native town, called the "Free Press," which proved unsuccessful. He then worked for a time as a journeyman in Boston. In 1827 he became the editor of the

"National Philanthropist" in that city, the first journal ever established to advocate the cause of "total abstinence;" and in 1828 he joined a friend in the publication of the "Journal of the Times" at Bennington, Vt. This journal supported John Quincy Adams for the presidency, and was in part devoted to peace, temperance, anti-slavery, and other reforms; but it failed to receive an adequate support. During his residence in Bennington he produced considerable excitement upon the subject of slavery, not only in that place but throughout the state, in consequence of which there was transmitted to congress an anti-slavery memorial more numerous signed than any similar paper previously submitted to that body. Benjamin Lundy, an advocate of the gradual abolition of slavery, was then engaged in publishing the "Genius of Universal Emancipation" at Baltimore. He had met Mr. Garrison during the previous year in Boston, and received from him timely assistance in bringing his cause to the notice of the people of that city. Wishing for a coadjutor, he went to Bennington and engaged Mr. Garrison to join him in the editorship of his journal. On July 4, 1829, Mr. Garrison delivered in Park street church, Boston, an address which excited general attention by the boldness and vigor of its assault upon slavery. In the autumn he began his labors in Baltimore as joint editor with Mr. Lundy of the "Genius of Universal Emancipation," and in the first number issued under his supervision he made a distinct avowal of the doctrine of immediate emancipation as the right of the slave and the duty of the master. Mr. Lundy did not concur with him in this doctrine, but as each of them appended his initials to his articles, the difference interposed no barrier to hearty coöperation. The journal, by its bold and uncompromising tone, produced considerable excitement among the supporters of slavery, while Mr. Garrison's denunciations of the colonization society aroused the hostility of some who, upon other grounds, were inclined to sympathize with him. An event soon occurred which resulted in a dissolution of his connection with the paper. The ship *Francis*, owned by Francis Todd of Newburyport, having taken a cargo of slaves from Baltimore to Louisiana, Mr. Garrison denounced the act as a "domestic piracy," and declared his purpose to "cover with thick infamy" all those implicated therein. Baltimore being then the seat of an extensive domestic traffic in slaves, his denunciation produced a great deal of feeling, and he was in consequence indicted and convicted, in the city court, May term, 1830, for "a gross and malicious libel" against the owner and master of the *Francis*, and sentenced to pay a fine of \$50 and costs of court. Being unable to discharge the judgment, he was committed to jail. Mr. Todd, in a civil suit for damages, subsequently obtained a verdict against him for \$1,000; but the judgment, probably on account of his well known pover-

ty, was never enforced. His friend Lundy and a few other Quakers were the only persons who visited him in jail to express their sympathy. The press at the north generally condemned his imprisonment as unjust, and his letters to different newspapers excited a deep interest. The manumission society of North Carolina protested against his imprisonment as an infraction of the liberty of the press. He remained in jail 49 days, when Arthur Tappan, a merchant of New York, paid the fine and costs, and he was set at liberty. It subsequently appeared that Mr. Tappan had in this act anticipated by a few days the generous purpose of Henry Clay, whose interposition had been invoked by a mutual friend. His next step was to issue a prospectus for an anti-slavery journal, to be published in Washington; and with a view to excite a deeper interest in his enterprise, he prepared a course of lectures on slavery, which he subsequently delivered in Philadelphia, New York, New Haven, Hartford, and Boston. In Baltimore his attempts to obtain a hearing were unsuccessful. Private efforts to procure a suitable place for the delivery of his lectures in Boston having been made in vain, he advertised in one of the daily journals that, if a meeting house or hall were not offered before a certain day, he would address the people on the common. An association of persons calling themselves infidels thereupon proffered him the gratuitous use of a hall under their control, and, no other offer being made, he delivered his lectures in the place thus opened; taking care, at the same time, to avow his faith in Christianity as the power which alone could break the bonds of the slaves. His lectures were attended by large audiences, and awakened in some minds a permanent interest in the anti-slavery cause. His experiences as a lecturer, however, convinced him that Boston rather than Washington was the best location for an anti-slavery journal, and that a revolution of public sentiment at the north must precede emancipation at the south. He accordingly issued the first number of the "Liberator" in Boston, Jan. 1, 1831, taking for his motto, "My country is the world, my countrymen are all mankind;" and declaring, in the face of the almost universal apathy upon the subject of slavery: "I am in earnest. I will not equivocate, I will not excuse, I will not retreat a single inch, and I will be heard." Mr. Isaac Knapp was his partner in the printing and publishing department. As they were without capital or promise of support from any quarter, they were unable to open an office on their own account. The foreman in the office of the "Christian Examiner," being a warm personal friend of Mr. Garrison, generously employed him and his partner as journeymen, taking their labor as compensation in part for the use of his types. Mr. Garrison, after working mechanically in the daytime, spent a large portion of the night in editorial

labor. Having issued one number, they waited anxiously to see whether they would find encouragement to proceed. The receipt of \$50 from James Forten, a wealthy colored citizen of Philadelphia, with the names of 25 subscribers, was the first cheering incentive to perseverance, and the journal was issued without interruption from that day. At the end of three weeks they opened an office for themselves; but for nearly two years their resources were so restricted that they made the office their only domicile. The "Liberator" attracted general attention, not only at the north, but at the south. The mayor of Boston, Harrison Gray Otis, having been appealed to by a southern magistrate to suppress it if possible by law, wrote in reply that his officers had "ferreted out the paper and its editor, whose office was an obscure hole, his only visible auxiliary a negro boy, his supporters a very few insignificant persons of all colors." Almost every mail, at this period, brought letters threatening Mr. Garrison with assassination if he did not discontinue his journal; and in December, 1831, the legislature of Georgia passed an act, offering a reward of \$5,000 to any person who should arrest, bring to trial, and prosecute to conviction, under the laws of that state, the editor or the publisher. On Jan. 1, 1832, he secured the coöperation of eleven other persons in organizing the New England (afterward Massachusetts) anti-slavery society, upon the principle of immediate emancipation. This was the parent of those numerous affiliated associations by which the anti-slavery agitation was for many years maintained. In the spring of 1832 he published a work entitled "Thoughts on African Colonization," &c., in which he set forth at length the grounds of his opposition to that scheme. He went immediately afterward to England, as an agent of the New England anti-slavery society, to solicit the coöperation of the people of that country in measures designed to promote emancipation in the United States, and to lay before them his views of the colonization project. He was warmly received by Wilberforce, Brougham, and their associates. In consequence of statements made by Mr. Garrison, Wilberforce and eleven of his principal coadjutors issued a protest against the American colonization society, pronouncing its plans delusive, and its influence an obstruction to the abolition of slavery. He also succeeded in inducing Mr. George Thompson, one of the most prominent champions of the anti-slavery cause in Great Britain, to come to the United States as an anti-slavery lecturer. Soon after Mr. Garrison's return, the American anti-slavery society was organized at Philadelphia, upon the principles of which he was the champion. The "Declaration of Sentiments" issued by the association—an elaborate paper, setting forth its principles, aims, and methods—was prepared by him. The agitation previously excited was now greatly intensified, and at length awakened a resistance which manifested it-

self in a mobocratic spirit, insomuch that for several years the holding of an anti-slavery meeting almost anywhere in the free states was a signal for riotous demonstrations, imperilling property and life. Mr. Thompson's arrival from England in 1834 inflamed the public mind to such a degree that at length, by the advice of his friends, he was induced to desist from his labors and return to his native land. In October, 1835, a meeting of the female anti-slavery society of Boston was riotously broken up by a collection of persons, described in the journals of the day as "gentlemen of property and standing." Mr. Garrison, who went to the meeting to deliver an address, after attempting to conceal himself from the fury of the mob in a carpenter's shop in the rear of the hall, was violently seized, let down by a rope from the window to the ground, and, partly denuded of his clothing, dragged through the streets to the city hall; whence, as the only means of saving his life, he was taken to jail by order of the mayor, upon the nominal charge that he was "a disturber of the peace." He was released on the following day, and, under protection of the city authorities, escorted to a place of safety in the country. These scenes of violence were followed by a discussion of the peace question, in which he took an earnest part as a champion of non-resistance; and in 1838 he led the way in the organization of the New England non-resistance society. About this time the question of the rights of women as members of the anti-slavery societies began to be mooted, Mr. Garrison contending that, so far as they wished to do so, they should be permitted to vote, serve on committees, and take part in discussion, on equal terms with men. Upon this question there was a division of the American anti-slavery society in 1840; and in the "World's Anti-Slavery Convention," held that year in London, Mr. Garrison, being a delegate from that society, refused to take a seat because the female delegates from the United States were excluded. In 1843 he was chosen president of the society, and continued to hold the office till 1865, when, slavery having been abolished, he resigned, deeming the time had come for the dissolution of the society. In 1846 he made his third visit for anti-slavery purposes to Great Britain. In 1843 a small volume of his "Sonnets and other Poems" was published in Boston; and in 1852 appeared a volume of "Selections" from his writings. He was ever earnestly opposed to the formation of a political party by the abolitionists, from a conviction that such a measure would inevitably corrupt the purity of the movement and postpone the day when emancipation might be secured. He never sought or contemplated the abolition of slavery in the states by congress or any other branch of the national government, his views as to the powers of that government over the subject being the same that were generally held by statesmen of all

parties at the north, as well as by many at the south. His first idea was that slavery might be abolished by moral influence, with such incidental aid as the national government could constitutionally afford, and without disturbing the union of the states; but upon this point he at length changed his opinions, his observation of the movements of political parties and his reflections upon the provisions of the constitution relating to the subject leading him to the settled conclusion that some of the conditions of compact between the free and the slave states were immoral, and that a dissolution of the Union was necessary to the freedom of the north and the emancipation of the slaves. He continued to urge this opinion until the breaking out of the civil war in 1861 changed the entire aspect of the slavery question, and he saw clearly that the system must inevitably be overthrown by the exercise of the war powers of the national government. Thenceforth he bent his energies to the work of hastening that consummation; and in April, 1865, by invitation of the secretary of war, he joined the party of northerners who went to South Carolina to see the flag of an emancipated Union raised upon the battlements of Fort Sumter. The first number of the "Liberator," issued in 1831, found the whole nation asleep over the wrongs and dangers of slavery; the last number, issued on the last of December, 1865, after 35 years of conflict with the slave power, recorded the ratification of an amendment to the constitution of the United States, for ever prohibiting the existence of slavery. The paper was thus discontinued at the very moment when the object for which it was established was fully consummated. Soon after the close of the war, a large number of persons, including some of the most eminent in the land, united in presenting to Mr. Garrison the sum of about \$30,000, in token of their appreciation of his unremitting labors for the abolition of slavery. In 1867 he once more visited Great Britain, where the most distinguished citizens and statesmen united in honoring him for his devotion to the cause of the oppressed.

GARROTE, a mode of execution practised in Spain and the Spanish colonies. The criminal is seated, and leans his head back against a support prepared for it. An iron collar closely encircles the throat, and the executioner turns a screw, the point of which penetrates the spinal marrow where it unites with the brain, and causes instantaneous death. Formerly the garrote was merely a cord put round the neck and suddenly tightened by the twisting of a stick inserted between the cord and the back of the prisoner's neck. Hence the name of this mode of execution, *garrote* in Spanish signifying stick. Its origin may probably be traced through the Moors or Arabs to the oriental punishment of the bowstring, which in its primitive style it exactly resembled. Afterward an iron collar was used by which the criminal was suddenly strangled. The piercing of the spinal

marrow is a later addition.—The term garroting is also applied to a mode of strangulation practised by thieves and highway robbers. An English law of 1861 subjected garroters to penal servitude for life, or for any term not less than three years; and in 1868 it was ordered that male garroters should, at the discretion of the judge, be once, twice, or thrice privately whipped.

GARROW (or *Gare*) **HILLS**, an elevated district of British India, situated in the bend of the Brahmapootra, where that river turns from its westerly course southward, between lat. 25° and 26° N., and lon. 90° and 91° E.; area, 8,890 sq. m.; pop. 50,000. The district is a square tract of hills, plateaus, and mountains, rising from the adjacent lowlands to heights of from 8,000 to 4,000 ft. The prevailing geological formation is red and white granite, overlaid with clay and sand of like colors. It is separated from the Cosaya or Khosia hills on the east by a band of wood and jungle, 18 m. wide, running along the 91st parallel. The Garrow hills form a spur of the Burmese mountains overhanging the valley of the Brahmapootra, but reaching the river itself. The country is finely wooded, well watered, and exceedingly fertile, principally yielding cotton. The climate is extremely unhealthy. In respect to its rainfall the Garrow and Cosaya region is one of the most remarkable localities on the globe, from 500 to 600 in. of rain having been known to fall on the S. slope of the mountains in one year. The name of the district is derived from the appellation of its inhabitants, concerning whom very little is known. They have maintained a singular isolation during the whole period of British supremacy in India, and no effectual jurisdiction was exercised over their territory till 1865, nor has their country ever yet been thoroughly explored. They are an active, dark-skinned race, usually classed with the aboriginal sub-Himalayan tribes; ethnologically they are believed to be closely related to the Gonds of central India. They are addicted to hereditary blood feuds. The district is now under the supervision of the Bengal government, being included politically in the non-regulation division of Assam. American missionaries maintain eight schools in it.

GARTER, *Order of the*, the highest British order of knighthood, and one of the oldest and most illustrious of the military orders of knighthood in Europe, commonly said to have been instituted by Edward III. of England, about 1350. The precise date of its foundation has been much disputed. In Rastel's "Chronicle" it is stated that the order was devised in 1192 by Richard I., who made 26 of his knights wear blue thongs of leather around their legs in a battle fought with the Saracens on St. George's day. One account says that Edward in 1346 gave his garter for the signal of a battle (supposed to be that of Crécy) which was crowned with success; and being victorious on land and sea, and having as prisoner David,

king of Scotland, he instituted this order, April 28, 1349, in memory of these exploits. According to Selden, the order was instituted April 28, 1344; according to Nicolas, in 1347; according to Ashmole, in 1349. In Burke's "Peerage" it is said that "the most noble order of the garter was instituted by Edward III. about August, 1348." In the accounts of the great wardrobe the garters of the order are first mentioned in 1348. Most writers, however, agree that its institution dates from a tournament at Windsor, held April 28, 1344, to which Edward invited the most illustrious knights. It was founded in honor of the Trinity, the Virgin Mary, St. George, and St. Edward the Confessor; and St. George, who was already the tutelary saint of England, was considered its especial patron and protector. An ancient tradition connects the emblem of the order with the story popularly told of Edward and the countess of Salisbury. When she happened at



Insignia of the Order of the Garter.

a ball to drop her garter, the king took it up and presented it to her, at the same time exclaiming, with reference to those who smiled at the action: *Honi soit qui mal y pense* ("Evil to him who evil thinks"). Edward added "that shortly they should see that garter advanced to so high an honor and renown as to account themselves happy to wear it."—The habit and insignia of the order are: The garter, of dark blue velvet, edged with gold, bearing the motto in golden letters, with buckle and pendant of gold, richly chased, worn on the left leg below the knee; the mantle, of blue velvet, lined with white taffeta, with a star embroidered on the left breast; the hood, of crimson velvet; the surcoat, likewise of crimson velvet, lined with white taffeta; the hat, of black velvet, lined with white taffeta; a plume of white ostrich feathers, having in the centre a tuft of black heron's feathers, all fastened to the hat by a band of diamonds; the collar, of gold, con-

sisting of 26 pieces, each in form of a garter, enamelled azure; the George, or figure of St. George on horseback encountering the dragon, attached to the collar, and the lesser George pendent from a broad dark blue ribbon over the left shoulder; the star, of eight points, silver, upon the centre of which is the cross of St. George, gules, encircled with the garter; and the ribbon of the order, garter blue. By a statute passed Jan. 15, 1805, the order is to consist of the sovereign and 25 knights companions, together with such lineal descendants of George II. as may be elected, always excepting the prince of Wales, who is a constituent part of the original institution. Special statutes have since at different times been proclaimed for the admission of sovereigns and extra knights, the latter of whom have, however, always become part of the 25 companions on the occurrence of vacancies. The last sovereign elected was the sultan Abdul-Aziz, who was invested by the queen on board of her yacht at the naval review, July 17, 1867. The knights are designated as K. G., "knights of the garter;" their strict designation, however, is *equites aurea periscelidis*, "knights of the golden garter." At the beginning of 1873 there were, besides the queen and the prince of Wales, 47 knights of the garter. They were: the duke of Edinburgh, Prince Arthur, and Prince Leopold, sons of the queen; the ex-king of Hanover and the duke of Cambridge, members of the royal family; the ex-emperor of the French, the king of Italy, the emperor of Germany, the king of Portugal, the king of Denmark, the king of the Belgians, the emperor of Austria, the emperor of Russia, the sultan of Turkey, and the emperor of Brazil; the crown prince of Germany, and 7 other German dukes and princes, and 24 British peers. The officers of the order were: the bishop of Winchester, prelate; the bishop of Oxford, chancellor; the garter principal of arms, and the usher of the black rod.

GARTH, Sir Samuel, an English physician and poet, born in Yorkshire, died in London, Jan. 18, 1719. He studied medicine at Cambridge, settled in London in 1693, and soon secured an extensive practice, and became noted for his classical taste, liberality, and social habits. A quarrel had existed for some years between the physicians who advocated and the apothecaries who opposed the establishment of a free dispensary for the poor. Garth sided with the former, and wrote in their support "The Dispensary," a satirical poem of 2,000 lines in imitation of Boileau's *Lutrin* (1699; 9th revised ed., 1706). Garth was the leading whig physician of the time, and a member of the Kit-cat club. He wrote several short poems, and partly made a translation of Ovid's "Metamorphoses" (1717), to which Dryden, Addison, Gay, and many others contributed. He was knighted by George I. in 1714.

GÄRTNER, Joseph, a German botanist, born in Calw, Würtemberg, March 22, 1732, died

July 13, 1791. He studied at Tübingen and Göttingen, travelled in Italy, France, England, and Holland, became professor of anatomy at Tübingen in 1761, and of botany at St. Petersburg in 1768. He returned to Calw after two years, where he devoted himself for the remainder of his life to the study of botany, making several long journeys for that purpose. His labors are important in the history of this science, since he was the first to observe that plants are naturally divided into classes by their carpalogical features. His principal work is *De Fructibus et Seminibus Plantarum* (2 vols., Stuttgart, 1789-'91).

GARVE, Christian, a German philosopher, born in Breslau, Jan. 7, 1742, died there, Dec. 1, 1798. He succeeded Gellert as professor of philosophy at Leipsic in 1769, but ill health compelled him to return to Breslau in 1772. Kant appreciated his rare psychological genius and his benevolent nature. His numerous writings, some of which are in Latin, relate chiefly to the philosophy of history and of life, and to ethics and literature. He translated works of Aristotle, Paley, and Adam Smith, and Cicero's *De Officiis*, the last at the suggestion of Frederick the Great, of whom Garve was an enthusiastic admirer, as evinced in his *Fragmente* relating to that monarch.

GAS (Sax. *gast*, Ger. *Geist*, Dutch *geest*, spirit), a generic term used to designate any æriform fluid which is neither liquefied nor solidified at ordinary temperatures and pressure, introduced by Van Helmont in the early part of the 17th century. Excepting the atmosphere, little was known of æriform bodies by the ancients; but, under the name *spiritus* or *flatus*, artificial gas had been referred to by writers between the 14th and 17th centuries. It seems, however, to have been generally believed that such gases were only impure atmospheric air. Paracelsus noticed the evolution of gas by the action of oil of vitriol on iron as an eruption of air, but seems to have attached no special importance to it. Van Helmont was the first to attempt any systematic examination of gases, and to make a distinction between them and vapors; but his knowledge was necessarily imperfect, as he was not aware of the fact, long afterward demonstrated by Faraday, that most gases are condensable as well as vapors. The different gases are described under their respective titles. Most of their physical properties, and their absorption by liquids and solids, are treated of in the articles **HEAT**, **PNEUMATICS**, **ATMOSPHERE**, and **ABSORPTION**, together with notices of the principal discoveries pertaining thereto. The laws of their chemical combination are treated in the article **ATOMIC THEORY**. In the present article will be considered the general management and the diffusion of gases, and illuminating gas. **I. MANAGEMENT OF GASES.** The collection and preservation of gases for experiment and observation may be effected by one of three methods, depending upon the nature of the gas and the mode of its genera-

tion. 1. It may be received in an exhausted vessel by means of a tube and stopcock. This method usually requires that the vessel be several times filled with the gas and exhausted, to remove the residual air which always remains at the first exhaustion in consequence of inability to produce a perfect vacuum. Bags, which may be very nearly emptied of their contents, are often conveniently employed in this method of collection.

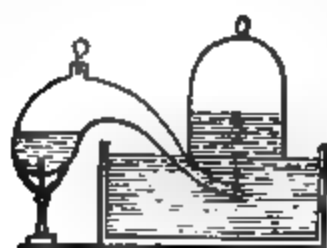


FIG. 1.—Collection by Displacement.

2. By displacement. This is done by filling a bell glass with water in a pneumatic cistern, placing it on the shelf, and bringing the mouth of the tube delivering the gas beneath it, as represented in fig. 1. When the gas to be collected is easily absorbed by water, some other liquid is chosen, usually mercury. A modification of this plan, often used in collecting gases slightly absorbable by water, as hydrogen and oxygen, for ordinary experimental purposes, is to use a gas-holder, consisting of a copper cylindrical vessel, A, fig.

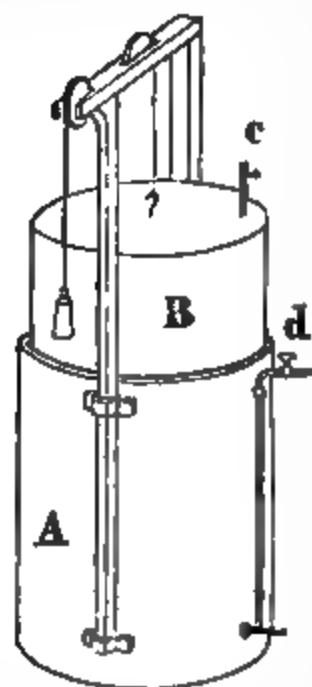


FIG. 2.—Gas-holder.

2, open at the top, in which is received a cylinder, B, closed at the top and open below, and counterbalanced by a weight attached to a cord passing over pulleys. By filling the outer cylinder with water, opening the stopcock *c* in the upper one, and depressing it, all the air may be forced out. Then, by attaching the delivering pipe to the stopcock *d* in the outer cylinder, the gas will ascend into the inner one, which will rise as the pressure is restored to its interior. When a strong jet is required for use, weights may be laid upon the inner cylinder and the counterbalance weights removed. Another form of gas-holder is represented in fig. 8. A drum of copper, A, has mounted upon it a shallow vessel, B, communicating by two tubes with stopcocks, *g* and *h*, one of the tubes passing to near the bottom of the cylinder, while the other only enters the top. A water gauge, *e f*, shows the height of water in the drum; an opening at *t* admits the end of the tube supplying the gas, and a stopcock at *c* is for its exit. To use the apparatus, open the stopcocks, close the opening *t* with a plug, and pour water into the vessel B until the drum is filled; then close the stopcocks and remove

the plug from the opening *t*. Atmospheric pressure prevents the water from flowing out. Introduce the end of the tube supplying gas; it will ascend in the drum, displacing an equal volume of water, which flows out at *t*. When sufficient gas has been introduced, close the opening *t*, and open the stopcock *g*. The gas in the drum will then receive a hydrostatic pressure equal to the height of the column of water in

FIG. 3.—Gas-holder.

the tube and upper vessel above the level of water in the drum. The stopcock *c* may then be connected with any apparatus to which it may be desired to deliver the gas. The forms of apparatus of this kind may be varied indefinitely, but these examples will suffice for illustration. When it is desirable to separate mixed gases, which are absorbable in different degrees by different liquids, or when it is desired to saturate a liquid with a gas, an apparatus called Woulfe's bottles (fig. 4) is often used. The gas is made to enter each bottle at *a* and to pass out at *a*. A safety and supply tube, *s*, passes through a middle neck to below the surface of the liquid. A cup at the upper end is for the purpose of receiving a portion of liquid which may be forced up the tube by any sudden expansion. The number of bottles employed may be varied according to

FIG. 4.—Woulfe's Bottles.

the requirements of the case. II. DIFFUSION OF GASES. All gases, when mingled together mechanically in any proportion, tend to diffuse themselves uniformly, regardless of their specific gravities. Thus, if two bottles are connected together by an upright glass tube 10 or 12 inches long and about $\frac{1}{8}$ of an inch in calibre, and the upper bottle is filled with the lightest of all gases, hydrogen, and the lower one with oxygen, whose specific gravity is 16 times that of hydrogen, or with carbonic acid, which is 22 times as dense, after the lapse of two or three days the two gases will be found to have the same proportion to each other in both bottles. This was the original experiment of Dalton, published in vol. xxiv. of the "Phil-

osophical Magazine." The same result was obtained by Berthollet with a tube 10 inches long and one fifth of an inch in calibre, when the apparatus was placed in a position which secured a uniform temperature, so that no motion could be communicated to the gases. When the upper vessel contained hydrogen, the time occupied in diffusion was about 12 days; but when it contained air, oxygen, or nitrogen, several weeks were occupied in the complete diffusion. If a cylinder is filled with any gas and placed in a horizontal position, and an open tube bent at right angles is inserted at one end, turned upward if the gas is lighter than air, and downward if heavier, after a time the gas will escape from the cylinder and its place be occupied by air. The results given in the following table were obtained by Graham, and show the proportions of different gases which escaped from 100 volumes in four and in ten hours:

NAME OF GAS.	Sp. gr.	In 4 h.	In 10 h.
Hydrogen.....	1	61.6	94.5
Light carburetted hydrogen.....	8	48.4	62.7
Ammonia.....	8.5	41.4	59.6
Olefiant gas.....	14	34.9	48.8
Carbonic acid.....	22	31.6	47.0
Sulphurous acid.....	32	27.6	46.0
Chlorine.....	85.4	23.7	39.5

It is here seen that the lighter gases are the more readily they escape, and that this tendency to diffusion is nearly in the inverse proportion of the square root of their densities. If the cylinder contains a mixture of gases, those which are the lightest and therefore the most readily diffusible will escape with the greatest rapidity. Vapors also diffuse themselves among one another and among the permanent gases in accordance with the same law. If the mouth of the tube, in the apparatus mentioned above, is closed with a porous substance like plaster of Paris or wood, and the cylinder is filled with hydrogen, this gas will escape much faster than the air will enter. It appears, therefore, that the smaller the calibre of the orifices through which the diffusion takes place, the greater will be the proportional rapidity

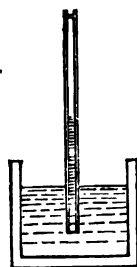


FIG. 5.—Graham's Diffusometer.

of the transfusion of the lighter gas; a fact having a close relation to the phenomena of osmose, which it greatly aids in explaining. Graham has made extensive experiments on the diffusion of gases. By using an instrument called a diffusion tube or diffusimeter, by means of which exact measurement could be made of the rate at which interchange took place, he found that diffusion through porous septa followed the same law as when the communication was by tubes of sensible diameter; that is, that the diffusibility of gases is in

proportion to the square roots of their densities. The diffusimeter used by Graham (fig. 5) consists of a glass tube of about one inch calibre and one foot in length, and a vessel partly filled with mercury. One end of the tube is stopped with a plug of plaster of Paris, one fifth of an inch thick, which is formed by mixing the plaster into a paste with water, introducing it while in a plastic state, and allowing it to set and dry. When the tube is filled with hydrogen and its open end placed in the vessel of mercury, diffusion takes place through the porous plaster plug, the atmospheric air passing in and the hydrogen passing out; but the latter action is so much the more rapid that in three minutes the mercury will rise in the tube three inches above its level in the outer vessel, and in 20 minutes all the hydrogen will escape. Graham afterward used compressed graphite, such as is used in making writing pencils, in place of the plaster of Paris, and considered it superior; but the results which he obtained with it did not alter the conclusions arrived at in the first series of experiments.—*Atmolysis, or the Separation of Gases by Diffusion.* When a mixture of gases passes through a graphite plate into a vacuum, a rapid separation takes place, in proportion to the difference of pressure. This method of separation may be performed with an apparatus called an atmolyser (fig. 6). A porous earth-



FIG. 6.—Atmolyser.

enware pipe, *a*, passes from a bag, *b*, containing the mixed gases, to the receiver *c*, over a pneumatic cistern. A large tube, *e*, surrounds the smaller one, and the space between them is kept as nearly vacuum as possible by means of an air pump exhausting through the tube *d*. A slight pressure upon the bag causes the gases to flow through the tube *a*, but the lighter ones will to a great extent pass through the sides of the tube and be removed by the air pumps. In an experiment made in this manner with atmospheric air, the proportion of oxygen was increased to 24.5 per cent. When a mixture of oxygen and hydrogen is used, the separation is much greater. In one experiment an explosive mixture of one volume of oxygen with two of hydrogen, after atmolysis, contained only 9.3 per cent. of hydrogen, in which a taper burned without producing explosion. The diffusion of gases through one another was regarded by Dalton as a necessary consequence of the self-repulsive property of the particles of gaseous bodies, by reason of which each gas expands into the space occupied by the other as it would into a vacuum. But although the velocities with which they diffuse into each other are in proportion to those with which

they rush into a vacuum through an aperture in a thin plate, still they do not strictly act as vacua to each other; for the diffusion of one gas into another is vastly slower than its passage into a vacuum. III. ILLUMINATING GAS. This is to a limited extent obtained from natural sources, but the great supplies are made from the following substances: 1, coal; 2, wood; 3, peat; 4, resin; 5, petroleum; 6, oils and fats; 7, water and coke. There are many localities where combustible gases have long been known to issue from the earth. Gas has been used in China for centuries, conveyed in bamboo tubes from fissures in salt mines in excavations from 1,200 to 1,600 ft. in depth. Near the Caspian sea in Asia there are several so-called eternal fires caused by gas issuing from the soil. In the Szalatna salt mine in Hungary illuminating gas constantly issues from a muddy clay contained between rock-salt strata. The village of Fredonia, N. Y., is lighted by gas which issues from bituminous limestone interspersed among the slates and sandstones of the Portage group. This gas consists of a mixture of marsh gas, CH_4 , and hydride of ethyl, C_2H_6 . A flow of natural gas issued from a well which was sunk in 1865 at West Bloomfield, Ontario co., N. Y., for the purpose of obtaining petroleum. Its composition, according to Prof. Silliman and Wurtz, is: marsh gas, 82.41; carbonic acid, 10.11; nitrogen, 4.81; oxygen, 0.28; illuminating hydrocarbon, 2.94. It was carried in a wooden main to the city of Rochester, a distance of 24 miles, in 1870, for the purpose of illuminating the city, but the experiment was a failure. Such gas has also been known to issue from beneath peat bogs, as that of Chatmoss, near the Manchester and Liverpool railway in England. These natural gases are of variable composition, light carburetted hydrogen or marsh gas being usually the principal constituent.—*Coal Gas*. The first artificial production of illuminating gas from coal is due to Dr. Hales or the Rev. John Clayton, rector of Crofton, Wakefield, Yorkshire, England. Dr. Hales describes in a book published in 1727, called "Vegetable Statics," an experiment by which he obtained 180 cubic inches of inflammable air from 158 grains of Newcastle coal. In 1659 Mr. Thomas Shirley communicated a paper to the royal society on an inflammable gas which issued from a well near Wigan in Lancashire; and the Rev. John Clayton nearly a century later, in examining the locality, found that the gas issued from a bed of coal. The experiment of subjecting the coal to heat was made, with the result of obtaining an illuminating gas, which, being collected in bladders, could be burned in jets. An account of these experiments was communicated to the royal society in 1739. Dr. Rickel, professor of chemistry at Würzburg, in 1786 lighted his laboratory with gas made by the dry distillation of bones; and in the same year Earl Dundonald of Scotland, in obtaining tar from the distillation of coals,

also collected an illuminating gas, with which he lighted Culross abbey by way of experiment. The first practical attempt at gas lighting is however generally accredited to William Murdoch, who in 1792 used coal gas for lighting his workshops at Redruth in Cornwall. His invention remained unknown till about 1802, when it was introduced at the Soho foundry of Boulton and Watt, near Birmingham. In the mean time Lebon, a Frenchman, used gas made from wood for lighting his house, and was therefore considered by the French as the inventor of gas lighting. In 1804 Mr. Murdoch lighted the mills of Phillips and Lee at Manchester with gas which yielded an amount of light equal to that of 8,000 sperm candles. In 1813 London bridge was lighted with gas, and about the same time it was introduced into the streets in that part of the city; but it was not introduced into Paris till 1820.—Bituminous coals, such as English cannel and boghead coals, Ohio cannel, and the caking coals of Pennsylvania, Maryland, and Virginia, are used in this manufacture. The following may be considered as the average composition of caking and cannel coals:

CONSTITUENTS.	Caking.	Cannel.
Carbon.....	87.752	75.25
Hydrogen.....	5.229	5.50
Nitrogen.....	1.702	1.61
Oxygen.....	8.506	18.88
Ash.....	1.898	2.81

There are also small quantities of sulphur and iron, mostly in the form of iron pyrites. The nitrogen has its origin in the organic matter from which the coal is derived. When bituminous coal is heated to redness in the presence of air, it is principally converted into gases which unite with oxygen; but if air is excluded, as when the coal is confined in retorts, the gaseous products, unable to unite with oxygen, may be collected in receivers and burned in tubes. The products of the destructive distillation of bituminous coal consist of a great number of gases, liquids, and solids, which may be conveniently included under the following heads, according to an analysis by Bunsen:

Coke.....	68.98	Olefiant gas.....	0.78
Tar.....	12.28	Sulphuretted hydro-	
Water.....	7.40	gen.....	0.75
Marsh gas.....	7.04	Hydrogen.....	0.50
Carbonic oxide.....	1.18	Ammonia.....	0.17
Carbonic acid.....	1.07	Nitrogen.....	0.08

The olefiant gas here represents not pure heavy carburetted hydrogen or elayl, but a mixture, in variable quantities, of acetylene, C_2H_2 , elayl, C_2H_4 , trityl, C_3H_4 , ditetryl, C_4H_6 , and several hydrocarbon vapors. There are also small quantities of cyanogen and sulphocyanogen. (See DISTILLATION, DESTRUCTIVE.)—Upon the temperature to which the coal is subjected depend the products of distillation, which are formed by a rearrangement of the elements of the coal. The lower the heat,

the less will be the weight of coke or carbonaceous residue in the retort, and therefore the greater will be the quantity of carbon which remains combined with hydrogen; but the hydrocarbons so formed will be mostly liquid and solid, and not gaseous. On the other hand, the higher the temperature the greater will be the weight of solid carbonaceous residue; and the proportion of permanent gases will be increased, and their levity also, in proportion to the heat, so that they may be almost entirely composed of hydrogen and carbonic oxide. A mean temperature has therefore to be employed by the gas manufacturer, and this will also depend upon the quality of the coal or other material used. Practically it is impossible to subject the entire mass of coal to the most favorable conditions, be-

cause the different portions contained in a retort are necessarily subjected to different degrees of heat.—The manufacture of gas from coal, as well as from wood, petroleum, or resin, consists of three processes: 1, the distillation of the crude gas; 2, its separation from tarry and other condensible matters; 3, its purification from other deleterious and unpleasant gases. The distillation is performed in fire-clay retorts placed in furnaces, from five to ten retorts being placed in one furnace in large works, which may contain 100 furnaces. They are usually of a semi-cylindrical shape, somewhat like that of a sole drain tile, about 9 ft. in length, and from 16 to 20 in. in diameter. They were formerly made of cast iron, as fire clay was too porous and allowed the gas to escape; but since the introduction of appara-

FIG. 7.—Synoptical Plan of Gas Works.

tus for relieving the pressure, which will be described further on, fire-clay retorts are found sufficiently tight, and are much more durable. Moreover, they may be glazed and rendered more impervious than iron. A longitudinal section of a furnace and two retorts is shown in fig. 7, and also a plan of the different parts of a gas works, so arranged as to give an idea of the process of manufacture, but not showing the parts in their actual position, as this would be impossible in one figure. The two retorts, of a set of five, are shown at *a, a*, the furnace at *b*, the chimney at *c*. The retorts are first raised to a red heat, and then charged about two thirds full with coal by means of a kind of scoop having somewhat the form of the retort, and about the same length, which is introduced by two men, turned over, and withdrawn. The operation is called stoking, and the men who perform it stokers. Machinery is now being introduced in this country and in Europe, by which it will be performed by steam power. From 100 to 200 lbs. are usually introduced at one charge. A lid is then fitted to the mouthpiece of the retort with bolts and a luting of gypsum mixed with iron filings, and

a heat of about 2,200° continued for about five hours. The constituents of the coal are thus converted into the products given in the above table, and those portions, comprising all except the coke, which are volatile at that temperature, pass into the tube *d*, called the stand pipe, which ascends from the mouth of the retort and is inserted into the hydraulic main, a transverse section of which is shown at *e*. This is a long tube, usually semi-cylindrical, and from 18 to 24 in. in diameter, running the whole length of a row of furnaces, which may be 100 or 200 ft. When the operation of distillation commences, the main is partly filled with water, into which the stand pipes leading from the retort dip and discharge all the gases and vapors, a considerable portion of which, from the reduction of temperature, are there condensed, forming tar and ammoniacal liquor, which would soon fill the main were it not drawn off from time to time. In this way the fluid contents are kept at about the same level, and there is no necessity of adding water after the first supply. A large pipe, *f*, carries the still uncondensed gases and vapors to the cooler and condenser *g*, through which they

pass in a series of η -shaped pipes, surrounded with water which is supplied from a cistern, entering at the bottom of the condenser and passing out at the top. This arrangement is not represented in the diagram, which also only shows a small portion of one condenser, of which there are usually three, through which the gas passes successively, being reduced in temperature in each. At the base of each condenser are chambers into which the legs of the η -shaped pipes pass, the descending one, or that which carries the gas downward, extending to near the bottom, beneath the surface of the tar and ammoniacal liquor, which then collects and passes off by suitably arranged pipes into the tar well. These tarry matters, together with those collected in the hydraulic main, are the materials from which the beautiful aniline colors used in dyeing are made. (See ALIZARINE, ANILINE, ANTHRAENE, and COAL PRODUCTS.) From the condensers the gas is conducted into another apparatus for further separation of impurities. This is sometimes made of a box containing lumps of coke or fire brick moistened with water, and is then called a scrubber. At the Manhattan gas works, New York, a box, partially shown at *h*, called a washer, is used; it consists of several separate vertical chambers, through which the gas is made to pass, under one partition and over the next, and during its passage subjected to the action of jets of water thrown into spray. In this way nearly all condensible and soluble impurities are abstracted; but there remain several deleterious gases, the principal of which are sulphuretted hydrogen and carbonic acid, which must be removed before the gas is fit to be delivered for consumption. Several methods have been devised for this purpose, such as passing the gas through milk of lime, which is called the wet-lime process, or through layers of moistened slaked lime, and also through layers of mixed protochloride of iron and quicklime, or sulphate of iron and slaked lime, the ferruginous salts being very effectual in removing all traces of sulphuretted hydrogen. These slaked-lime purifiers are placed in large rooms, and require great care in management, as well for safety as for effectiveness, the gas being liable to escape into the room and form an explosive mixture with the air; and serious accidents have resulted from this cause. A single purifier is represented at *k* in the diagram. It consists of a tight double-sided tank from 4 to 6 ft. high and about 20 ft. long by 12 wide. A deep gutter runs around the upper edge, which is nearly filled with water for receiving the edges of the lid, *l*, by which means the apparatus is effectually sealed. It is usual to conduct the gas successively through three of these purifiers. In small works, especially those connected with the larger ones for experiment, the gas is forced from the retorts, by the pressure there created, through all the different pieces of apparatus; and formerly this was the only means of urging the gas on-

ward in all of them. The pressure thus created in large works would so retard the flow of the gas from the retorts that it would suffer much decomposition with production of graphite carbon; and if clay retorts were used, much would escape through their walls. The difficulty is avoided by using what are called exhausters to take the gas from the washers and deliver it to the lime purifiers. These machines may be in the form of a rotary fan blower, or of a cylinder and piston blowing machine. The lime purifiers have several lattice-work shelves, placed one above another and covered two or three inches in depth with freshly slaked lime. The gas entering at the bottom ascends through these layers of lime, which absorb the carbonic acid and sulphuretted hydrogen and other impurities by the time it reaches the chamber beneath the lid. In the figure a pipe is seen passing from the bottom of the washer directly to the lime purifier. It has, however, been explained that the exhausters is placed between these two pieces of apparatus. A drawing of the machine has been omitted in the cut from want of room, but the reader can supply the omission. In the latter there is an orifice from which a pipe conducts the gas to the meter, from which it passes through the pipe *o* to the large reservoir, a small part of which is shown in the figure. In the following table of the constituents of purified coal gas, that in the first two columns is ordinary coal gas from Chemnitz, Saxony; in the third column, ordinary London coal gas; and in the fourth, London canal coal gas:

CONSTITUENTS.	1.	2.	3.	4.
Hydrogen	51.29	50.08	46.0	37.7
Marsh gas	36.45	35.92	39.5	50.0
Carbonic oxide	4.45	5.02	7.5	6.8
Olefiant gas (elayl)	4.91	5.88	8.8	18.0
Nitrogen	1.41	1.89	0.5	0.4
Oxygen	0.41	0.54	...	...
Carbonic acid	1.08	1.23	0.7	0.1
Aqueous vapor .....	....	....	2.0	2.0

There are other heavy hydrocarbon gases besides elayl, or olefiant gas, as acetylene, trityl, and ditetryl, and also a small quantity of hydrocarbon vapors, which yield light; but the illuminating power of the gas may be regarded as depending principally upon the amount of olefiant gas (heavy carburetted hydrogen) which it contains, the bulk of other gases being carriers rather than light-producers. The olefiant gas is separated by ignition into marsh gas (light carburetted hydrogen) and carbon, the solid particles of which become incandescent and emit white light, which is observed in the luminous cone of a gas flame, and which has the same constitution as that of a candle. (See FLAME.) Of the impurities, tar is separated in the hydraulic main and the condenser; ammonia in the hydraulic main, condenser, and washer; sulphuretted hydrogen, cyanogen, and carbonic acid in the washer and lime and iron purifier,

a small quantity of the last named gas remaining. The luminosity of a gas flame depends both upon the percentage of heavy hydrocarbons it contains, and the amount of atmospheric air or oxygen mixed with it. Sometimes in passing it through many purifying processes a small amount of air is absorbed, the oxygen of which, combining with the carbon at the moment of ignition, causes an increased production of heat but diminution of light, on the principle of a Bunsen's burner. The illuminating power may therefore be estimated by analysis; but the practical method is to burn it in comparison with some light-producing body of known power, as a spermaceti candle. This test is made with an instrument called a photometer,

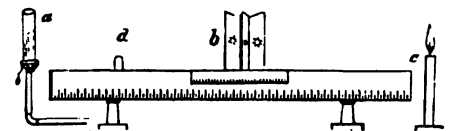


FIG. 8.—Bunsen's Photometer.

a common form of which is shown in fig. 8. An argand burner which consumes a certain number of cubic feet per hour (in experiments usually five feet) is placed at *a*, and a candle at *c*. Between them there is a horizontal graduated scale which supports a slide, *b*, bearing a ground glass screen having a figure in the centre more transparent than the rest of the plate. When this screen is moved to a point on the scale where the figure appears equally bright on each side, the light received from each source will be equal. If two candles are used, placed side by side, and the distance between them and the screen is one eighth that between the latter and the gas-burner, it will show that the light from the burner is equal to that of 16 candles. A simple screen may be used, or it may have a mirror placed upon each side at the further edge, at such an angle that the two will reflect images of the figure toward the observer, so that a comparison may be made at the same instant. Gas as usually furnished is estimated, when burning at the rate of five cubic feet per hour, to produce a light equal to that given in the same time by 16 or 18 standard sperm candles, each burning at the rate of 120 grains per hour.—The illuminating power of gas depends much upon the form of the burner. It is a matter of common observation that gas may be nearly deprived of its illuminating power if made to issue from the burner with great velocity, or if burned in a tall chimney which produces a very rapid current of air. Very small or thin flames also do not afford conditions of economical expenditure. The smaller or thinner the flame, the greater is its exposure to the oxygen of the air, and consequently the more rapid the consumption of the solid particles of carbon; in other words, the more nearly are the conditions present

which cause the flame of a Bunsen's burner to be nearly non-luminous. The conditions to be sought for in an illuminating flame are those which are most conducive to high heating of the carbon particles and to the keeping of them for the longest possible time in an uncombined state, but eventually insuring their complete combustion. A certain thickness of flame is therefore desirable. A poor gas, if burned in a jet issuing from a wide slit, may be made to yield a better light than a rich gas burned in a very thin flame, which is frequently the fault of the fish-tail burner. According to Prof. Silliman, the illuminating power of a given sample of gas burned in an argand burner is not in the proportion of gas consumed, but more nearly in the proportion of the square of the quantity.—A ton of 2,000 lbs. of good cannel coal, carefully distilled, will yield about 8,000 cubic feet of purified illuminating gas. Other bituminous coals yield from 6,000 cubic feet up to this amount. Every section of a gas works has one or more meters for measuring the volume of gas before it passes into the reservoirs. They are in the form of cylinders, usually about 12 ft. in diameter and from 8 to 12 ft. long. Fig. 9 is a transverse section showing the principle upon which they act. The outer cylinder or drum is stationary. The inner cylinder, turning upon a hollow axis, is divided by the partitions *a, a, a, a* into five compartments, one in the centre of the hollow axis, and four, *d, d, d, d*, spiral in direction, exterior to this; slits being

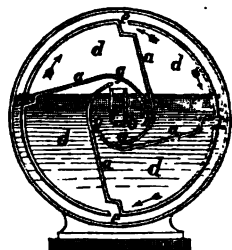


FIG. 9.—Gas Meter.

left open at *e, e, e, e* for the passage of the gas from the inner cylinder to the space between it and the outer one, from which it has exit. The apparatus is a little more than half filled with water. A tube, *c*, passing through the axis of the cylinder, rises a little above the surface of the water, and delivers gas to the central compartment, from which it passes into each outer compartment successively through the openings *g, g, g, g*. The movement of the inner cylinder is in the direction of the hands of a clock, and it will be seen that the gas can only pass through the slit *e* when it is above the water. The gas constantly passes into that compartment which is on the left in the figure. As this fills it raises that side, and consequently the opening of the compartment above, out of the water, from which the gas flows till it is submerged and emptied at the opposite side. A large pipe conveys the measured gas to the reservoirs or gas-holders, the large cylindrical structures so conspicuous about gas works, and which are constructed much upon the principle of the gas-holder for experimental purposes

shown in fig. 2. From the reservoir it is carried in cast-iron main pipes through the streets, and in small wrought-iron pipes into buildings, where it is measured to each consumer in small meters, which were formerly of a similar construction to the one above described; but of late years the wet has almost entirely been replaced by the dry meter, which was invented by Mr. James Bogardus of New York in 1832, and is one of the most ingenious of mechanical contrivances. It was fraudulently patented in England by a person who had been employed by Mr. Bogardus, and afterward adopted in the United States without due credit to the inventor. His invention consists of a double bellows having four chambers, which, alternately moved by the pressure of the gas which is admitted upon one side or the other by the opening and closing of valves by such movements, communicates motion to a series of arms and levers by which a rotary motion is given to an index that registers the number of cubic feet passing through the different chambers of the bellows. As these have a measured capacity, the volume of gas passing through the machine is therefore shown. Instead of a double bellows with four chambers, a triple one with six was at one time constructed; but the machine was essentially the same, the arrangement of the arms and levers, the most ingenious parts, having almost the same form and acting upon the same principle as the double bellows with four chambers. — *Wood Gas.* It has been said that Le Bon, a Frenchman, made gas from wood about the end of the 18th century; but the invention did not prove practicable, as the gas had not sufficient illuminating power to compare with that made in England from coals. The reason of its failure, as explained by Dumas, was that the heat employed was too low to produce the heavier hydrocarbons. In 1849 Prof. Pettenkofer of Munich made experiments showing that the gases evolved from wood at a heat sufficient to carbonize it consist almost entirely of carbonic acid, carbonic oxide, and marsh gas (olefiant gas being quite absent); but that the tarry matters and vapors at the same time produced are, by the application of a much higher heat, capable of yielding a large quantity of heavy hydrocarbon gas. The manufacture of wood gas therefore requires retorts for converting the wood into empyreumatic vapors, and others for converting these into permanent gases. The wood should be thoroughly dried before distillation. According to the experiments of Reissig, 50 kilogrammes of aspen wood yielded 592 cubic feet of purified gas and 10 kilogrammes of charcoal, and the same quantity of fir wood 648 cubic feet of gas and 9.5 kilogrammes of charcoal. Pettenkofer's analysis of crude gas is as follows:

Heavy hydrocarbons.....	6.91
Marsh gas.....	11.06
Hydrogen.....	15.07
Carbonic acid.....	25.73
Carbonic oxide.....	40.59

The carbonic acid is removed by hydrate of lime. Reissig's analysis of the purified gas is as follows:

Heavy hydrocarbons.....	7.24
Hydrogen.....	81.54
Marsh gas.....	85.80
Carbonic oxide.....	25.62

The illuminating power of the hydrocarbons in wood gas is one half greater than that of an equal volume of olefiant gas. Its specific gravity is about 0.7, which is rather greater than that of average coal gas, for which reason it requires burners with larger orifices. Wood gas is successfully made in Germany.—*Peat Gas.* Peat yields in dry distillation, according to an analysis by Vohl of a sample from Zürich, the following proportions of gaseous, liquid, and solid matters:

Gases.....	17.625
Tarry matters.....	5.875
Aqueous distillate.....	52.000
Peat coke.....	25.000

The same apparatus is used as for wood gas. Reissig used a fat peat obtained near Munich, 134 lbs. of which yielded 837 cubic feet of gas of good quality, having the following composition:

Heavy hydrocarbons.....	9.52
Marsh gas.....	42.65
Hydrogen.....	27.50
Carbonic acid.....	20.33

—*Resin Gas.* Resin yields a gas of high illuminating power, but its use is necessarily restricted by its limited supply. Several years ago it was successfully employed at the Philadelphia works to increase the richness of coal gas, and is now used in several southern towns.

—*Petroleum Gas.* Petroleum is used in small works for making illuminating gas in this country, and very largely in Germany, Austria, and Russia. The crude oil is conducted from a reservoir continuously into red-hot cast-iron retorts, from which it passes through purifying apparatus, one vessel of which contains hydrochloric acid. One hundred weight of Pennsylvania oil yields about 1,600 feet of gas, which when purified consists, according to Bolley, of

Heavy hydrocarbons.....	83.4
Light hydrocarbons.....	40.0
Hydrogen.....	26.0

It has a specific gravity of about 0.7, and is the richest that can be made. It is used in burners which consume only from one half to two cubic feet per hour, and it is estimated that 200 cubic feet are nearly equal in illuminating power to 1,000 feet of coal gas. The New York mutual gas light company own a patent for a process of making illuminating gas from the naphtha which passes over in the first part of the distillation of petroleum, and mingling it with coal gas, by which it is said that the latter is greatly enriched. The naphtha is volatilized in a separate boiler, and sent into retorts of similar construction to those for coal, where by the application of a

cherry-red heat it is converted into a gas rich in heavy hydrocarbons, mostly of the character of those made in using crude petroleum. The gas is conducted into a reservoir common to it and the coal gas, where the two mingle, in accordance with the law of the diffusion of gases.

—*Oil Gas.* The fixed oils are excellent gas materials. Rape oil, according to Lefort, has the formula $C_{18}H_{36}O_2$; hemp oil, $C_{18}H_{36}O_2$. All the fatty oils yield by dry distillation principally olefiant gas, a small quantity of carbonic acid, and no sulphuretted hydrogen; and if pure oil were used, it would require no purification, and apparatus only of the simplest kind. Under such circumstances perhaps a lamp is the most economical; but the gas may be made of impure oils and fats, in which case some purification is required. On the continent of Europe gas is made from suint, or the fatty materials contained in the soap suds after washing wool and yarns. The liquid is mixed in cisterns with milk of lime and left to stand 12 hours, when a kind of lime soap is formed, which is made into bricks and dried. These are subjected to dry distillation, and yield a gas of high illuminating power. The wash water of a woollen mill of 20,000 spindles will yield annually enough of this substance to produce over 1,100,000 cubic feet of gas; and if the time of burning is 1,200 hours, this quantity will supply 500 burners, each consuming nearly two cubic feet per hour, and giving a light more than sufficient for the mill.

—*Water Gas.* When steam is forced through retorts containing red-hot coke, charcoal, or anthracite, there are produced hydrogen, carbonic oxide, carbonic acid, and a small amount of light carburetted and of sulphuretted hydrogen gases. The carbonic acid and sulphuretted hydrogen may be removed by lime, or lime and oxide of iron. The remaining gases, principally hydrogen and carbonic oxide, may be used for heating purposes, or may be made available for lighting in two ways: 1, by heating coils of platinum wire in the flame; 2, by impregnating it with the vapors of various hydrocarbons, as benzole or naphtha, or mingling it with permanent hydrocarbon gases, the latter being preferable, as it has been found very difficult to convert the lighter hydrocarbon oils into products which will not cause a deposit in the distributing pipes. Many hundred patents have been issued to inventors for making this kind of gas. That of Selligie, a French gas engineer, proposed to him by Jobard of Brussels, consisted of a furnace and three vertical cylindrical retorts, the first two filled with charcoal or coke. Steam was passed into the first, causing evolution of the gases above mentioned, which were passed into the second retort, where the red-hot coal or coke converted the carbonic acid into carbonic oxide. The gases were then passed into the third retort, which was two thirds filled with red-hot iron chains, upon which a stream of oil from bituminous shale

was made to flow. Mr. White of Manchester patented several years ago a process by which the water gas was passed into another retort, in which illuminating gases were being generated, in such a manner as to sweep the latter out of the retort as quickly as possible, to remove them from the decomposing action of the intense heat. The retorts and settings were similar to those in use for ordinary coal gas, except that the retorts had a horizontal partition, dividing them into two chambers, extending to within a foot of the back. White's method is known as the English hydrocarbon process. Experiments show that anthracite can be used with greater advantage in producing water gas than coke or charcoal. —In 1877 the six permanent gases (so called because they had hitherto resisted all efforts to reduce them), hydrogen, oxygen, nitrogen, nitric oxide, carbonic oxide, and marsh gas, were successfully liquefied by M. Cailletet of Paris and M. Raoul Pictet of Geneva, working separately. Both accomplished the same end by different ingeniously contrived apparatus, each combining an exceedingly low temperature with great compression. M. Cailletet also reduced common air to liquidity, thus demonstrating the accuracy of the views of Lavoisier as to its possibility. The experiments confirm the inference of the English physicist, Thomas Andrews, that there exist critical points of pressure and of temperature, which must be united to insure the liquefaction of these gases.

GASCOIGNE, George, an English poet, born about 1587, died in Stamford, Oct. 7, 1577. He was educated at Cambridge and began to study law; but having fallen into irregular habits, he was deprived by his father of as much of his inheritance as possible, and took service in Holland under the prince of Orange, where he remained two years and distinguished himself for his courage. He made a free translation of *I Suppositi* of Ariosto, which was performed by the gentlemen of Gray's Inn in 1566 under the name of "The Supposes." Use was made of it by Shakespeare in "The Taming of the Shrew," and it is the earliest extant prose play in the English language. In 1575 Gascoigne joined the court of Queen Elizabeth, and wrote an account of the pageantries exhibited at Kenilworth, entitled "The Princely Pleasures of Kenilworth Castle." His satire in blank verse, "The Steele Glassee," first printed in 1576, and his other poems, were collected and published with the title "The Whole Workes of George Gascoigne, Esquyre" (4to, black letter, London, 1587).

GASCONADE, an E. county of Missouri, bounded N. by the Missouri river, and intersected by the Gasconade river; area, 540 sq. m.; pop. in 1870, 10,093, of whom 80 were colored. The surface is much broken, but well timbered, and there is good water power. Iron ore is found in abundance, sulphur and saltpetre are obtained, limestone and buhrstone are quarried, and copper has been discovered on Bourbeuse creek.

The Pacific railroad of Missouri passes through the N. part. The chief productions in 1870 were 222,850 bushels of wheat, 260,178 of Indian corn, 168,717 of oats, 31,738 of potatoes, 82,600 lbs. of butter, 128,917 gallons of wine, and 3,264 tons of hay. There were 3,270 horses, 3,811 milch cows, 4,301 other cattle, 8,398 sheep, and 17,057 swine. Capital, Hermann.

GASCONY (Fr. *Gascogne*), an old province in the S. W. corner of France, bounded N. by Guienne, E. by Languedoc and the county of Foix, from which it was partly separated by the upper Garonne, S. by the Pyrenees and Béarn, and W. by the Atlantic (the gulf of Gascony). It was originally inhabited by a population of Iberian blood, and received from the Romans the name of Novempopulana or Aquitania Tertia, which was changed to that of Gascony about the middle of the 6th century, when it was occupied by the Vascones, a tribe of northern Spain, whom the Goths had driven across the Pyrenees. It was more than once invaded by the Merovingian kings, but was never entirely subjugated until the time of Charlemagne. The supremacy of the French crown being finally established, the country was placed under the direct sovereignty of the duke of Aquitaine. Through the marriage of Eleanor of Aquitaine, ex-queen of France, with Henry Plantagenet, Gascony, in conjunction with the whole country which that princess held south of the Loire, fell to the crown of England in 1152. For 300 years it remained under the same allegiance, and returned by conquest to France in 1453. It formed afterward, with Guienne, one of the great governments of that country, and is now mainly comprised in the departments of Hautes-Pyrénées, Gers, and Landes.

GASCOYNE, William, the inventor of the micrometer, born in England about 1621, killed fighting for Charles I. at Marston Moor, July 2, 1644. The instrument, as constructed by him, consisted principally of two parallel wires or metallic plates, capable of being moved, which were placed in the focus of the eye glass of the telescope. The image was comprehended between these, and by means of a scale for the measure of angles its diameter was determined. Gascoygne used his instrument in various astronomical observations, and in determining the magnitude or distance of terrestrial objects.

GASKELL, Elizabeth Cleghorn, an English authoress, born at Chelsea about 1810, died at Alton, Hants, Nov. 12, 1865. Her maiden name was Stevenson, and she was the wife of a Unitarian clergyman, who was for some time a resident of Manchester. Her first novel, "Mary Barton," published in 1848, is a striking picture of the daily life of a large manufacturing town. The pathetic power of many of the scenes delineated, and the literary merit of the book, gave Mrs. Gaskell at once a position among the first writers of fiction of the day. She afterward became a contributor to "Household Words" and "All the Year Round," and her tales, after having appeared

in these journals, were republished in book form. Her principal works of fiction besides the one already mentioned were: "Moorland Cottage" (1850); "Ruth" (1853); "Cranford" (1853); "North and South" (1855); "Lizzie Leigh," "Round the Sofa" (1859); "Right at Last" (1860); "Sylvia's Lovers" (1863); and "Wives and Daughters" (1866). Most of them were republished in this country and translated into French. The work, however, which attracted the greatest attention was "The Life of Charlotte Brontë" (2 vols. 8vo, 1857). It was written in a charming style, and, as Mrs. Gaskell had been a personal friend of the author of "Jane Eyre," she was able to furnish many interesting details of her private life.

GASPARIN. I. Adrien Étienne Pierre, count de, a French statesman and agriculturist, born in Orange, June 29, 1783, died there, Sept. 7, 1862. He entered the army, but was soon compelled by illness to give up military life. After the revolution of 1830 he was made successively prefect of the departments of Loire and Isère, and in 1831 of Rhône; and for his promptness in suppressing an insurrection at Lyons in 1834 he was raised to the peerage. He became minister of the interior in 1836, and gave his attention especially to prison reforms and the establishment of hospitals. He occupied the same position in the short-lived cabinet of Maroh, 1839. In 1848 he accepted the management of the national agricultural institute at Versailles, which was abolished in 1852. He published a large number of papers and several extended works on agricultural subjects, the principal of which is *Cours d'agriculture* (5 vols., Paris, 1843-'9). **II. Agénor Étienne**, count de, a French publicist, son of the preceding, born in Orange, July 10, 1810, died in Geneva, May 14, 1871. He was employed in the ministries of public instruction and the interior, under Guizot and his father, and in 1842 was elected to the chamber of deputies for Bastia, Corsica. He was a conservative, but advocated parliamentary reform, the emancipation of slaves in the colonies, and the rights of the Protestant church, of which he was a member. His independence was not relished by the government; and his sympathy for Protestantism not being shared by his constituents, he failed of reelection to the chamber in 1846, and retired from political life. He was in the East when the revolution of 1848 took place. When solicited to declare himself in favor of the new constitution, he refused. His disapprobation of the form afterward given to the government by Louis Napoleon was even stronger, and he permanently removed to Switzerland. In the winter he resided near Geneva, and delivered courses of lectures on economical, historical, and religious subjects, many of which were subsequently published. During the civil war in the United States he published two works warmly sustaining the Union cause: *Les États-Unis en 1861: un grand peuple qui se relève*

(1861), translated and published in New York under the title "The Uprising of a Great People: the United States in 1861;" and *L'Amérique devant l'Europe* (1862), translated under the title "America before Europe." During the Franco-German war he addressed an appeal to the French people urging them not to persevere in it. His death was hastened by his exertions in the care of refugees from Bourbaki's army, whom he received into his house. Besides the works already mentioned, and numerous articles in the *Journal des Débats* and the *Revue des Deux Mondes* and other publications, he published *De l'amortissement* (1834); *Esclavage et traite* (1838); *Intérêts généraux du protestantisme français* (1848); *Christianisme et paganisme* (2 vols. 8vo, 1846); *Des tables tournantes, du surnaturel en général et des esprits* (2 vols. 12mo, 1854; translated into English); *La question du Neufchâtel* (1857); *La famille, ses devoirs, ses joies et ses douleurs* (2 vols. 12mo, 1865); and *La liberté morale* (1868). His *Vie d'Innocent III.* was published posthumously in 1873, and his *Le bon vieux temps* in 1874.—His wife, VALÉRIE BOISSIER, born about 1816, has been conspicuous as an opponent of religious and social innovations, and has published several volumes of travels and works on religious subjects. Two of these obtained the prize of the academy: *Le mariage au point de vue chrétien* (1842; 3d ed., 1858), and *Il y a des pauvres à Paris et ailleurs* (1846).

GASPÉ, an E. county of Quebec, Canada, bordering on the river and gulf of St. Lawrence, indented by the bay of the same name, and including the Magdalen islands; area, 4,578 sq. m.; pop. in 1871, 18,729, of whom 12,956 were of French, 2,384 of Irish, 2,221 of English, and 843 of Scotch origin or descent. It has a mountainous surface, diversified by many fertile valleys, and traversed by St. Anne, Dartmouth, and other rivers. The inhabitants are engaged chiefly in the lumber trade and fisheries. The settlements are confined almost wholly to the coasts, which are lined with excellent harbors. The Gaspésians, a part of the Micmac tribe of Indians, reside in Gaspé, at the mouth of the St. Lawrence. They are treated as a distinct tribe by the missionary Le Clerq in his *Gaspésie*, but are almost always included among the Micmacs. The use of hieroglyphics among them can be traced back to the 17th century. (See MICMACS.) Capital, Percé.

GASS, Friedrich Wilhelm Heinrich Joachim, a German theologian, born in Breslau, Nov. 28, 1818. After studying at the principal universities, he became professor of theology successively at Breslau, Greifswalde, Giessen, and Heidelberg, where he has been since 1868. His principal work is *Geschichte der protestantischen Dogmatik im Zusammenhange mit der Theologie überhaupt* (4 vols., Berlin, 1854-'67).

GASSENDI, Pierre, a French philosopher, born at Champcerrier, Provence, Jan. 22, 1592, died in Paris, Oct. 24, 1655. After having studied philosophy at Aix, he was appointed at the age

of 16 professor of rhetoric at Digne. When 20 years of age he was simultaneously elected to the two chairs of philosophy and theology at Aix, of which he chose the latter. While in this office his leisure was employed in the study of anatomy, astronomy, and even astrology, a science which he afterward condemned as a delusion. He resigned his professorship in 1623. In 1624 he published at Grenoble the *Exercitationes Paradoxicæ adversus Aristoteles*, in which he was the first to point the distinction between the church and the scholastic philosophy. He designed to complete the work in five books, but only two were ever written. About the same time he was appointed provost of the cathedral at Digne, but the appointment was contested, and was not confirmed until ten years later. Meanwhile he travelled for a time, and entered into correspondence with Galileo, to whom he expressed his concurrence with the Copernican system. Returning to Digne, he continued his ecclesiastical duties, and in 1680 wrote a treatise against the mystical and alchemistic doctrines of Robert Fludd. He was a constant correspondent of Kepler, who before his death had publicly announced that Mercury and Venus would pass over the disk of the sun on Nov. 7, 1631. Gassendi was the first to observe the passage of Mercury, and wrote a minute account of the phenomenon. On the appearance of the *Discours de la méthode* and the *Méditations* of Descartes, a controversy arose between the two philosophers. The daring and original genius of Descartes was in striking contrast with the erudition and critical acumen of his opponent, who excelled him in caution and courtesy. In 1645 Gassendi received from Cardinal Richelieu the appointment of mathematical professor in the royal college of France; and two years later he published at Lyons his biographical treatise, *De Vita, Moribus et Placitis Epicuri*, which was followed by his *Syntagma Philosophiæ Epicuræ* (Lyons, 1649). They form together a complete review of the life, eulogy of the character, and reconstruction of the philosophical system of Epicurus. The Epicurean ethics and physical theory of atoms and a vacuum are elaborately vindicated, and conformed to the principles of Christianity and the discoveries of modern science. His feeble health obliged him to resign his professorship, and he retired to Toulon, where he was occupied for two years with the preparation of another great philosophical work. In 1653 he returned to Paris, and there completed the work, the *Syntagma Philosophicum*, an encyclopædic view of the entire circle of science, and the most complete and learned statement of his opinions. It was not published until after his death, and forms the first two volumes of his complete works, edited by Montmor and Sorbière (6 vols., Lyons, 1658). It is divided into three parts, logic, physics, and ethics, is elaborated with great learning and minuteness of criticism, and contains an eclectic philosophy

formed by the union of ideas borrowed from various schools rather than a new system. His system is akin to that of Locke rather than of the French followers of Locke, and even a part of his phraseology, as the *actiones reflexivæ*, anticipates that of the "Essay on the Human Understanding." It does not appear, however, that Locke was acquainted with his writings. Not only as a metaphysician, but as an astronomer, geometer, anatomist, Hellenist, historian, and elegant writer, Gassendi merits distinction. He was the personal friend of most of the learned men of his time, the first disciple in France of Bacon, and the precursor of Newton. The aurora borealis, the parhelia, the conjunctions of Venus and Mercury, the occultations of the satellites of Jupiter, and the properties of the magnetic needle were among the subjects of his researches. He wrote the lives of the principal astronomers of his age, and in the preface gave a brief and admirable history of astronomy. By those who knew him he was beloved for his amiability and modesty. The latest complete edition of his works is that edited by Avernani (6 vols., Florence, 1728). An abridgment by Bernier (Paris, 1678) has been several times republished. His life has been written by Sorbière (for the first edition of his collected writings, Lyons, 1658), and by Bougerel (Paris, 1637).

GASTEIN, a valley in the Austrian duchy of Salzburg, famous for its romantic scenery and for its mineral springs. It is about 80 m. long and 2 m. broad, is surrounded by mountains in some parts about 8,000 ft. high, and is traversed by the Ache, which forms several cascades. There are three villages. Hofgastein, 40 m. S. of Salzburg, has a resident population of about 1,000. It contains a church, poorhouse, military hospital, and a statue of the emperor Francis I. of Austria. Gold and silver mines were formerly worked here. Dorfgastein, 6 m. to the north, is a mere hamlet. Wildbad Gastein, or Bad Gastein, about equally distant to the south, is one of the most celebrated watering places in Europe. It is about 8,000 ft. above the sea. In the centre of the village the Ache forms a cataract, which is spanned by a covered bridge 400 ft. long. There are about 35 houses, among which is a villa built by the late archduke John of Austria. The climate is cold and wet even in summer. In 1880 an aqueduct was constructed under the auspices of the emperor Francis to convey the mineral waters to Hofgastein, but Wildbad still continues to be the principal watering place in the valley. The accommodations for visitors are very limited, but it is annually resorted to by about 3,000 persons. The hot springs, which have a temperature of 117° F., spring from the granite rocks at the foot of the mountain, one of them bursting out in the middle of the cataract. They furnish about 100,000 cubic feet of water in 24 hours, the principal mineral ingredients of which are

Glauber salts and carbonate of lime. The baths are chiefly useful in nervous affections, general debility, paralysis, chronic diseases of the skin, and disorders arising from wounds. These springs have been known since the 7th century, and have long been a favorite resort for the noble and royal families of Germany. —A convention was held here in August, 1865, between the emperor Francis Joseph and King William of Prussia, and their respective ministers, in which the affairs of the duchies wrested from Denmark in the preceding year were settled. (See AUSTRIA, vol. ii., p. 149.)

GASTEROPODA (Gr. *γαστήρ*, belly, and *πούς*, *πόδες*, foot), a class of the mollusca distinguished by the under side of the body forming a single muscular foot, on which the animal creeps or glides. The snails, limpets, and chitons are examples of this class. They are divided into two natural groups, one breathing air (*pulmonifera*), the other water (*branchifera*). These form the four orders of *prosobranchiata*, *pulmonifera*, *opisthobranchiata*, and *nucleobranchiata*. The shell is usually spiral and univalve, but sometimes tubular or conical; in the chiton it is multivalve. Some marine species, as the *doris* and *aeolis*, have no shells. Most are provided with a horny or shelly operculum, which forms the bottom of the foot, and when withdrawn closely shuts the aperture of the shell, to which it is firmly held by the strong muscles of this part of the body. In some species, as the limpet and patella, the animal uses the expanded surface of the foot for attaching the shell firmly to rocks and other surfaces. Almost all are unsymmetrical, the body being coiled up spirally, and the respiratory organs of the left side usually atrophied. A few, like the snails, are viviparous, but most are oviparous. The shells are nearly all right-handed; the cavity is a single conical or spiral chamber, never many-chambered like the nautilus and the cephalopods; the apex is almost always directed backward. The lines between the whorls or turns of the shell are the sutures, the last or the body whorl being usually very large; the aperture is entire in most vegetable feeders, but notched or elongated into a canal or siphon which is respiratory in its office; there is sometimes a posterior or anal canal.

GASTON, a S. W. county of North Carolina, bordering on South Carolina, bounded E. by Catawba river and intersected by Catawba creek; area, about 350 sq. m.; pop. in 1870, 12,602, of whom 4,172 were colored. It has a diversified surface and a fertile soil. Gold has been obtained. It is traversed by the western division of the Wilmington, Charlotte, and Rutherford railroad. The chief productions in 1870 were 64,468 bushels of wheat, 338,023 of Indian corn, 79,717 of oats, and 762 bales of cotton. There were 1,218 horses, 1,166 mules and asses, 2,709 milch cows, 4,706 other cattle, 7,362 sheep, and 12,858 swine; a cotton factory, and a quartz mill. Capital, Dallas.

GASTON, William, an American jurist, born in New Berne, N. C., Sept. 19, 1778, died in Raleigh, Jan. 23, 1844. He graduated at Princeton, N. J., in 1796, with the highest honors, studied law, and was admitted to the bar at New Berne in 1798. Two years later he was elected to the senate of North Carolina, and subsequently to the house of commons, of which he was speaker in 1808. In the same year he was chosen by the federalists a presidential elector, and in 1818 he was elected to congress, where he served for four years, and became one of the most influential leaders of the federal party. He opposed the loan bill, which proposed during the war with Great Britain to place \$25,000,000 at the disposal of the president, as was generally understood for the conquest of Canada. His speech, which was widely read and greatly admired, embraced a thorough discussion of the policy, object, and management of the war. In 1817 he retired from congress to devote himself to his profession, in which he soon attained the foremost rank in North Carolina. In 1835 he was a member of the convention to revise the state constitution, took a leading part in all important debates, and in a great measure guided the business of the convention. He spoke and voted against the proposition to deprive free colored men of the right of suffrage, which at that time they possessed, but which was taken from them by the new constitution. In 1884 he was appointed a judge of the supreme court of North Carolina; but he was a Roman Catholic, and by the constitution of that state, as commonly interpreted, was therefore incapable of holding any state office. Such, however, was the universal regard for his character and ability that the clause in the constitution against the Catholics became a dead letter. He continued in this office till his death, which was sudden.

GASTON DE FOIX, duke of Nemours, a French general, born in 1489, killed at Ravenna, April 11, 1512. He was the son of Jean de Foix, viscount of Narbonne, and of Marie d'Orléans, sister of Louis XII. In 1505 he was made duke of Nemours. In the beginning of 1512, at the age of 23, he was appointed commander of the French army in Italy, to carry on the war with Venice, the pope, and King Ferdinand of Spain, who had formed a "holy league" against Louis XII. He raised the siege of Bologna, defeated the Venetian army under the walls of Brescia, and on the same day carried that city by storm. A few weeks later, on April 11, he brought the allied army to a decisive action under the walls of Ravenna, and, in one of the most hotly contested battles ever fought, defeated them with a loss on both sides of 20,000 men. Flushed with victory, he was exasperated at the deliberate manner in which the Spanish infantry left the field, and charged them rashly in person, followed by Bayard and about 20 other knights. He broke their line, but his horse was wounded, and fell in the midst of

the enemy. When Bayard reached him he was already dead. His loss so disheartened the French that they reaped little advantage from their great victory. A monument near Ravenna marks the place where he fell.

GASTRIC JUICE. See **DIGESTION.**

GATAKER, Thomas, an English ecclesiastic, born in London, Sept. 4, 1574, died June 27, 1654. He wrote several works illustrative of the Scriptures. In 1642 he was chosen member of the assembly of divines at Westminster. In 1648 he remonstrated, in conjunction with 47 of his brethren, against the proceedings of the long parliament in relation to the king. In 1652 he published a critical edition of Marcus Aurelius's "Meditations," with notes, and an introductory discourse on the philosophy of the Stoics. The best edition of his works is that of Utrecht, 2 vols. folio, 1698.

GATCHINA, a town of Russia, in the government and 28 m. S. S. W. of the city of St. Petersburg, on a small lake formed by the Izhora river; pop. in 1867, 8,337. It is the private property of the emperor, and is famous for the imperial palace, built by Prince Gregory Orloff, and purchased on his death by Catharine II., who presented it in 1784 to her son, the grand duke Paul. The latter made it his favorite residence, and in 1797 granted municipal franchises to the town which grew up around the palace. The grounds are extensive and well laid out, and the park is intersected by lakes and streams which abound in trout. The emperor maintains a kennel here, but the palace is rarely inhabited by the present imperial family, and many of the paintings have been removed to the Hermitage. There are manufactures of porcelain, cloths, and hats.

GATES, a N. E. county of North Carolina, bordering on Virginia, bounded S. W. by Chowan and Nottaway rivers, the former of which is here navigable; area, 853 sq. m.; pop. in 1870, 7,724 of whom 3,207 were colored. The surface is generally level, and much of it is covered with oak and pine timber. The Dismal swamp occupies the extreme N. E. part. The principal exports are tar and lumber. The chief productions in 1870 were 158,070 bushels of Indian corn, 54,186 of sweet potatoes, and 151 bales of cotton. There were 774 horses, 1,358 milch cows, 2,521 other cattle, and 11,411 swine. Capital, Gatesville.

GATES, Horatio, an American soldier, born in England in 1728, died in New York, April 10, 1806. He early entered the British army, and was an officer under Braddock, at whose defeat in 1755 he was severely wounded. After the peace of 1763 he purchased an estate in Virginia, where he resided till the organization of the continental army in 1775. Appointed adjutant general with the rank of brigadier, he accompanied Washington to Cambridge in July, 1775, and in June, 1776, received the chief command of the army which had just retreated from Canada. In the autumn following he joined Washington in New Jersey with a con-

siderable detachment, and in March, 1777, in effect superseded Schuyler in the command of the northern army, and was superseded by him in May. When, however, Schuyler was obliged to retreat down the Hudson by the disasters which followed the loss of Ticonderoga, Gates was reinstated in the command by congress, Aug. 4, 1777. The surrender of the British army at Saratoga, which followed, gave him a brilliant military reputation, though it was in some measure due to the previous operations of Schuyler. In the winter of 1777-'8 "Conway's cabal" intrigued to wrest the supreme command from Washington to bestow it upon Gates. The latter was engaged in no important military operations till in June, 1780, he was appointed to the command of the southern forces. The disastrous battle of Camden (Aug. 16) lessened his military fame, and he was superseded by Gen. Greene. His conduct was scrutinized by a committee of congress, and after the surrender of Cornwallis he was restored to his military position. On the conclusion of peace he retired to his estate in Virginia, whence, after emancipating all his slaves, he removed in 1790 to the city of New York.

GATESHEAD, a municipal and parliamentary borough of Durham, England, on the right bank of the river Tyne, opposite Newcastle, with which it is connected by a fine railway viaduct and by a stone bridge; pop. in 1871, 48,592. Its manufactures are closely connected with those of Newcastle, and comprise ships, anchors, chain cables, nails, hemp, wire ropes, iron castings, locomotive engines, boilers, &c. There are extensive collieries and grindstone quarries in the vicinity.

GATH, one of the five chief cities of Philistia, often mentioned in the history of David and his successors. The giant Goliath, who was slain by David, was either a native or an inhabitant of Gath. It was for centuries alternately under the power of the Jewish kings or independent, except a short period when it was under Syrian rule. In the time of Jerome it was a "very large village." There is much dispute as to its site, three different places being suggested. The one now considered most probable is Tel es-Safieh, 10 m. S. E. of Ashdod, and 22 m. S. W. of Jerusalem, where are considerable ruins.

GATLING, *Richard Jordan*, an American inventor, born in Hertford co., N. C., Sept. 12, 1818. While yet a boy he assisted his father in perfecting a machine for sowing cotton seed, and another machine for thinning cotton plants. Subsequently he invented and patented a seed-sowing machine for sowing rice. Removing to St. Louis in 1844, he adapted his invention to sowing wheat in drills. For several winters he attended medical lectures at Laporte, Ind., and at the Ohio medical college in Cincinnati; and in 1849 he removed to Indianapolis, where he engaged in real estate speculations and railroad enterprises. In 1850 he invented a double-acting hemp brake, and in 1857 a steam

plough, which however he did not bring to practical results. In 1861 he conceived the idea of the revolving battery gun which bears his name. (See *ARTILLERY*, vol. i., p. 797, and *CANNON*, vol. iii., p. 718.) He made his first gun at Indianapolis in 1862, and in the fall of that year he made six of the guns at Cincinnati, which were destroyed by the burning of the factory. He subsequently had 12 manufactured, which were used by Gen. Butler on James river. In 1865 he further improved his invention, and in the year following, after satisfactory trials at Washington and at Fortress Monroe, the arm was adopted into the United States service. It is also made in Austria and England, and has been adopted by several governments of Europe. During the past ten years Dr. Gatling has devoted himself to the perfection of this invention, spending much time abroad in testing his gun in public; and he now (1874) resides in Hartford, Conn.

GAUCHOS, horsemen of the plains in the Argentine and other South American republics. They are generally of pure Spanish race, having mingled but little with the aborigines. They are usually tall and graceful; their hair is black and frequently worn long, with full beards and moustaches. Their dress consists of a loose flowing shirt, at times fancifully embroidered; wide drawers, the lower extremities of which are commonly of open work and terminated with a fringe; a quadrangular piece of stuff passed between the legs and bound to the waist, one end in front and the other behind, by means of a belt, so as to fall in folds far below the knees; boots of the skin of a colt's hind legs; a poncho, worn only in wet or cold weather; and finally a small round hat, with a narrow brim. To shield the back of the head and neck from the rays of the sun, the gaucho makes use of a handkerchief fastened to the crown of the hat, falling down behind, and secured by drawing the two lower corners beneath the chin. When not exposed to the sun, the handkerchief lies loosely upon the shoulders, with a sailor's knot in front. To these are added a long knife, the *trador*, which performs the double office of purse and girdle, and a pair of huge spurs. The dress of the women, most of whom are remarkably handsome, is composed of a low-cut tightly fitting bodice and short skirt, with a shawl so drawn around the head as barely to leave the face and front hair visible, but completely covering the neck and shoulders. The arms are rarely encumbered by any garment; and the hair is secured by a large comb. When on horseback the women often wear European dresses with body and sleeves, and a handkerchief like that of the men. The gaucho dwellings are rude huts, with walls of alternate layers of willow and mud, the roof being thatched. The furniture is extremely scanty. It usually consists of a wooden bedstead, with a mattress of skin bound to the sides with thongs; two ropes stretched parallel to each other from wall to

wall over the bed, serving as a cradle for the children, who are lashed to them; a kettle in which to make the maté or Paraguayan tea, and a few cups with tin pipes through which it is sucked. Around the walls hang the bolas, lasso, and other hunting implements. In hot weather the hut is deserted night and day, as the owners sleep in the open air. Their food is chiefly composed of beef, which they roast in huge pieces. The gauchos are admirable horsemen, and are expert in the use of the bolas and lasso. (See BOLAS, and LASSO.) This dexterity is acquired only by uninterrupted practice almost from infancy, the gaucho passing his life on horseback. Their occupations are breaking in wild horses, watching herds, and marking and slaughtering the animals. They are polite and hospitable, but indolent and vindictive, and addicted to gambling and intemperance. In

Gauchos.

fighting they endeavor to lash each other's faces; frightful scars are frequent, and the most trifling quarrels often result in loss of life. They are zealous Roman Catholics. As guides across the pampas, they are invaluable. The number of the gauchos as a distinct class is rapidly decreasing.—The gauchos have played a very conspicuous part in the history of the South American struggles, and many of their chiefs, natural rivals of the more enlightened but less energetic and reckless popular leaders in the Atlantic cities, have achieved the highest honors in their respective republics; some of them, like Rosas, exercising their powers with unmitigated rigor.

GAUDEN, John, an English prelate, born in Mayland, Essex, in 1605, died Sept. 20, 1662. Having preached an acceptable sermon before the parliament, he received from it the living of Bocking and other preferments. After the

breaking out of the civil war he retained his preferments, submitted to the Presbyterian discipline, omitted the liturgy from the church service, and subscribed to the covenant. Meanwhile he secretly wrote a "Protestation" against the king's trial, a "Just Invective against those who murdered King Charles I.," and other similar papers. They were published after the restoration, when he declared himself a royalist, and was appointed chaplain to Charles II., afterward bishop of Exeter, and in 1662 of Worcester. His death is said to have been hastened by his not getting the rich see of Winchester, on which he had set his heart. The *"Εἰκὼν Βασιλέως"*: the Portraiture of his Sacred Majesty K. Charles I. in his Solitudes and Sufferings," which is attributed to him, was at first supposed to have been written by Charles himself, and went through 50 editions, at home and abroad, in a single year (1648-'9). After carefully examining the evidence, Sir James Mackintosh came to the conclusion that Gauden was really the author of the book.

GAUDICHAUD-BEAUPRÉ, Charles, a French botanist, born in Angoulême, Sept. 4, 1780, died in Paris, Jan. 26, 1854. In 1817 he accompanied, in the capacity of pharmaceutical botanist, the scientific expedition of Freycinet. His vessel, the *Uranie*, was wrecked upon the Falkland islands in the spring of 1820, and of the 4,175 botanical specimens which he had collected upward of 2,500 were lost. After his return to France he prepared the botanical history of the voyage. In 1830-'38 he took part in the expedition which explored the coast of South America in the *Hermione*, and subsequently circumnavigated the globe again in the *Bonite*. He was a member of the institute and connected with the museum of natural history, where he passed the remainder of his life, devoted to the classification of his specimens and the preparation and publication of his notes; and he carried on an acrimonious controversy with Mirbel on the subject of the process of vegetable growth. Among his numerous publications were: *Voyage de la Bonite (botanique)* (4 vols. 8vo); *Recherches générales sur l'organographie, la physiologie et l'organogénie des végétaux* (4to, 1841); *Recherches générales sur la physiologie et l'organogénie des végétaux* (4to, 1842-'7); and *Mémoires et notices diverses sur l'anatomie et la physiologie des végétaux* (2 vols. 8vo, 1851).

GAUGING, the operation of measuring the capacity of any receptacle, as for example that of a cask, barrel, or vat. It may be performed either by measuring the dimensions of the receptacle and then calculating its capacity upon geometrical principles, or, without the necessity of any calculation, by means of a gauging rod suitably adjusted for the purpose. Though the contents of a vessel cannot ordinarily be ascertained in practice with absolute accuracy by these methods, the art is of service in the collection of excise duties, inasmuch as the contents of a vessel are ascertained by means of

it without being disturbed.—See Symons's "Practical Gauger," Leadbetter's "Treatise on Gauging," Hutton's "Mensuration," &c.

GAUL (Lat. *Gallia*), the name applied by the Romans to two great divisions of their empire, Cisalpine and Transalpine (in regard to Rome). **I. Cisalpine Gaul** (*Gallia Cisalpina* or *Citerior*), comprising the north of Italy to the confines of Etruria and Umbria, was divided by the Po (Padus) into Cispadane and Transpadane. It was also called *Gallia Togata*, or Romanized Gaul, from the inhabitants wearing togas like the Romans. It was bounded N. W. and N. by the Alps, E. by the Athesis (now Adige), S. E. by the Adriatic, S. by the Rubicon, the Apennines, the Macra (Magra), and the mountains of Liguria. Both divisions of this portion, like all Transalpine Gaul, were inhabited mostly by people of Celtic race (Gaelic and Kymric), called by the Romans in general Gauls (*Galli*), by the Greeks *Κέλται* or *Γαλάται*; the Tuscan and some other elements of the population in Cisalpine Gaul, and the Celto-Teutonic, Teutonic, Celto-Iberian, Iberian, and Greek in Transalpine Gaul, were comparatively small. (See CELTS.) It is generally believed that the Gauls, who are undoubtedly a branch of the great Indo-European family, left their Asiatic homes before the dawn of European history, and occupied the western regions on the Rhine, Seine, Rhône, and Garonne, Ebro, and Tagus, as well as the islands of Britain, when the Roman state was still in its infancy. Turbulent, roving, and warlike, some of the tribes entered northern Italy, according to Livy, under Bellovesus, a nephew of King Ambigatus, in the time of Tarquin the Elder. Others are said by the same historian to have returned eastward toward the Hercynian forest, under Sigovesus, another nephew of Ambigatus. Still others appeared later, though it is uncertain whence they came, in Macedonia, Thrace, and Greece, where they were reported at Delphi, 278 B. C.; and even in Asia Minor, where they founded Galatia or Gallo-Græcia (see GALATIA), in Syria, and in Egypt. There are no precise historical dates for the consecutive invasions of Cisalpine Gaul by the Celts; they are supposed to have occupied several centuries. Tribe followed tribe, and finally we find the Salassians settled in the vicinity of Ivrea (Eporedia), the Insubrians about Milan (Mediolanum), the Cenomani in the region of Verona and Mantua, the Boii in the country lately forming the duchies of Parma and Modena and about Bologna (Bononia), the Lingones about Ravenna, the Senones, who came last, in the S. E. part of Cispadane Gaul, and other tribes in various other parts of the country. It was not long after the conquest of Veii by the Romans that this people came in contact with the Gauls. These invaders had conquered the northern possessions of the Etruscan confederacy while the Romans were making their attacks on its southern districts. They had pushed the Umbrians southward,

taken Melpum (about 396 B. C.), crossed the Apennines under one of their Brenni, as their chiefs were called, and advanced as far as Clusium. The Tuscans of this city sought aid from the Romans, who sent no army to their assistance, but despatched the Fabii as envoys to deter the barbarians. The envoys only provoked them, and excited their hostility against Rome. Brennus broke up the camp before Clusium, crossed the Tiber, routed the Romans on the Allia, entered Rome through open gates, and pillaged it; but after an obstinate siege of the capitol, he sold his conquest for gold and retired with his army. Subsequent invasions proved disastrous to the barbarians. In 367 they were routed near Alba by Marcus Camillus. In 361 another host, like the first of the Senonian tribe, encamped before the Anio bridge, but marched further toward Campania before fighting a battle. Shortly after returning from Campania they renewed their ravages, and fought unsuccessfully against the dictators Ahala and Peticus. In 350 they again encamped before Rome, keeping it in perpetual terror; but in the following year L. Furius Camillus, a nephew of Marcus, compelled them to retire. When in a later period the Gauls assisted the Umbrians and Etruscans against the advancing Romans, they were routed in the battle of Sentinum (295), where many of them fought on war chariots, and near Lake Vadimon (283). These disasters, suffered chiefly by the Senonian and Boian Gauls, put an end to Gallic wars in Italy for nearly 60 years. The Romans, who had conquered Umbria, founded their first colony in Cispadane Gaul, in the land of the Senones, calling it Sena Gallica (now Sinigaglia); Ariminum (Rimini) was founded afterward. The Gauls were too much weakened to offer any opposition. Being strengthened by the arrival of large bodies from beyond the Alps, they took up arms again in 225, and crossed the Apennines, but were soon compelled to retreat, and were routed at Telamon. The Romans continued the war with great vigor, conquered the land of the Boii, crossed the Po, on the opposite banks of which they soon after founded Cremona and Placentia (Piacenza), and subdued the Insubrians (221). When Hannibal crossed the Alps (218) he was eagerly joined by numerous Gauls, but after his final defeat Cisalpine Gaul became an easy prey to the victorious legions. It was made a Roman province at the beginning of the following century, received numerous new Roman colonies, became civilized, industrious, and flourishing, and finally obtained the privileges of Roman citizenship. Of the eleven divisions of Italy, as established under Augustus, it formed the last four. The Salassians, who revolted under the same reign, were nearly exterminated. The Romanization of the province was rapidly developed, and from this time its history becomes identified with that of the Roman empire. **II. Transalpine Gaul** (*Gallia Transalpina* or *Uterior*) was bounded

W. and N. by the sea, E. by the Rhine, S. E. by the Alps, and S. by the Mediterranean and the Pyrenees, thus comprising not only the whole of modern France and Belgium, but also parts of Switzerland, Germany, and Holland. Upon its southern coast Phœnicians, Rhodians, and Phœceans had at various remote periods planted colonies and introduced some rudiments of civilization, the arts of writing, mining, and working metals, and the olive and vine. The Romans first entered this portion of Gaul at its S. E. angle. In 166 B. C. the Maritime Alps were first crossed by Roman legions, who defeated the tribes of the western slopes. In 154 they defended Massilia (Marseilles), a colony of Phœcæa, and herself the mother of numerous colonies, against the Ligurians. Twenty years later they fought against the Salyes, a Celto-Ligurian tribe. Soon afterward they founded Aquæ Sextiæ (Aix), and subdued the Allobroges, who lived between the Rhône (Rhodanus) and the Isère (Isara), and were assisted by the Arverni (121). This new course of Roman conquests was interrupted by the great Cimbrio-Teutonic movement (see CIMBRI), but the two victories of Marius at Aquæ Sextiæ (102) and on the Raudian fields (101), over the Teutons and Cimbri, saved both the Transalpine and Cisalpine possessions of Rome. The former, eventually extending from the Alps to the Pyrenees, and embracing the modern provinces of Dauphiny, Languedoc, Provence (from the Roman *Provincia*), Roussillon, and Nice, were called Gallia Braccata or Comata, from the wide trousers (*bracææ*) or the long hair (*coma*) of the inhabitants. The internal development of the main parts of Transalpine Gaul, during the times when the Cisalpine country was successively Gallicized and Romanized, cannot be traced in historical records. When the Romans, in the last period of their republic, finally entered the northwest, they found the country occupied by various tribes, ruled by nobles, priests, and chiefs or kings. Cæsar, the conqueror of the people and historian of their last struggles for independence, comprehends all of them under the general name of Gauls, dividing them into three large groups: Belgians, in the northeast, between the Rhine, Seine (Sequana), and Marne (Matrona); Celts, or Gauls proper, in the centre and west, between the Seine, Marne, and Garonne (Garumna); and Aquitanians, in the southwest, between the Garonne and the Pyrenees. In the first of these groups Kymric and Belgic elements seem to have prevailed, in the second Gaelic, in the third Iberic and other non-Celtic elements, though the divisions of Cæsar do not fully coincide with the lines of distinction drawn by modern ethnologists. Among the more important tribes were the Batavi, near the mouths of the Rhine; the Nervii, in the southwest of modern Belgium; the Eburones, about Liège; the Ambiani, about Amiens; the Morini, "the remotest of men," about Boulogne; the Atrebatæ, in Artois; the Bel-

lovaci, about Beauvais; the Suessiones, about Soissons; the Parisii, about Paris (Lutetia); the Remi, in Champagne (Rheims); the Treveri, about Treves; the Teutonic Tribocci, Ubii, and Nemetes, on the Rhine; the Eburones, about Evreux; the Cenomani, in Maine; the Armorican Nannetes (Nantes), Veneti (Vannes), and Redones (Rennes), the chief representatives of the Kymric race, in Brittany; the Turones, in Touraine; the Andes or Andegavi, in Anjou; the Carnutes, about Chartres and Orleans; the Lingones, about Langres; the Senones, about Sens (Agendicum); the Lemo-vices, in Limousin; the Santones, in Saintonge; the Pictones, in Poitou; the Arverni, in Auvergne; the Helvii, in Vivarais; the Gabali, in Gévaudan; the Ædui, in the region of Autun (Bibracte); the Mandubii, about Alise Ste. Reine (see ALESIA); the Insubres, in Lyonnais; the Bituriges, in earlier times a leading tribe, about Bourges (Avaricum); the Sequani, about Besançon (Vesontio); the Helvetii, in Switzerland; the Bituriges Vivisci, about Bordeaux (Burdigala); and the Tarbelli, in Béarn. At the time of Cæsar's invasion, the Gauls had towns, and used the art of fortification with success; they had long known the arts of embroidering and working metals, and were regarded as the inventors of various implements of husbandry; the Armoricans possessed a navy; the Gallic country was reputed to be the richest in Europe. But their manners were rude, their speech was rough, milk and swine's flesh were the principal aliments, their villages were disfigured with inhuman trophies, the treatment of captive or slain enemies was barbarous, bloody fights and duels were customary, hounds were used in war, polygamy was not prohibited, and females were little more than slaves; the polytheism which prevailed among the common people, especially among the Gael, was coarse, and human victims were sacrificed to the gods. (See DRUIDS, and BARD.) The remains commemorative of Gallic culture are extremely scanty. The details of Cæsar's conquest of Gaul may be read in his "Commentaries." Its chief events are the defeat of the Helvetians near Bibracte, and the expedition against the Suevi under Ariovistus, undertaken on the call of the Ædui, in 58; the conquest of Belgic Gaul, in 57; the invasion of Armorica or Brittany by land and sea, the submission of Aquitania, and the reduction of the wild tribes on the N. W. coast, in 56; the sudden and successful attacks of the Eburones under Ambiorix, and their annihilation, in 54 and 53; the great rising of central Gaul under Vercingetorix, the double blockade at Alesia, and the fall of Avaricum, the last stronghold of the natives, in 52. The loss of the Gauls in these struggles, in which genius and discipline conquered unbridled and tumultuous valor, was little less than a million men. The whole Transalpine country was divided by Augustus into four provinces: Gallia Narbonensis (Narbonne),

the former Provincia Romana, Gallia Aquitania, Gallia Lugdunensis, and Gallia Belgica, to which were added the later divisions Germania Superior or Prima, and Germania Inferior or Secunda, on the Rhine. Other subsequent divisions are less important. For more than two centuries after its conquest by Cæsar, Gaul remained almost entirely quiet, and its Romanization proceeded rapidly, the national habits and religion retiring by degrees toward the N. W. coast, and eventually finding refuge in the islands beyond it. The history of the country in the times of the Roman emperors, under the latter of whom it was Christianized, belongs to that of Rome. Civil wars and dissensions in the 3d century, and later the invasions of the Alemanni, Franks, Burgundians, Visigoths, Huns, and other barbarians, brought about its decay. Clovis made it Frankish. (See FRANCE.)—See Desjardins, *Géographie de la Gaule, d'après la table de Peutinger* (Paris, 1870.)

GAUME, Jean Joseph, a French author, born at Fuans, Doubs, in 1802, died March 22, 1869. He received holy orders at an early age, was appointed in 1827 professor of theology in the seminary of Nevers, and became successively director of that institution, canon of the cathedral, and vicar general. He is chiefly known as having led in the vehement opposition to the teaching of the pagan classics, which arose in France on the publication of his *Le ver rongeur des sociétés modernes* (Paris, 1851). In this work he traces all the social evils of the last 400 years to the revival of pagan art and literature. In the angry controversy which ensued, he was successfully opposed by Bishop Dupanloup. In 1852 appeared *Lettres à Mgr. Dupanloup sur le paganisme dans l'éducation*. In furtherance of his idea that no Latin or Greek authors should be read in the schools save such as are posterior to the 4th century, he began forthwith to issue *Bibliothèque des classiques chrétiens, latins et grecs* (30 vols. 12mo, Paris, 1852-'55), and *Poètes et prosateurs profanes complètement expurgés* (2 vols., 1857). He was made a knight of St. Sylvester in 1841 by Gregory XVI., and a prothonotary apostolic by Pius IX. in 1854. Of his many other works, the most important are: *Catéchisme de persévérance* (8 vols. 8vo, 1838; abridgment, 18mo, 20th ed., 1864, translated into English); *Histoire de la société domestique chez tous les peuples* (2 vols., 1844); and *Les trois Rome* (4 vols., 1848).

GAUSS, Karl Friedrich, a German mathematician, born in Brunswick, April 30, 1777, died in Göttingen, Feb. 23, 1855. He early displayed such remarkable capacity for mathematical calculation, that the duke of Brunswick took charge of his education. At the age of 18 he solved a problem which had occupied geometers from the time of Euclid, that of the division of the circle into 17 equal parts. In 1801 he published his *Disquisitiones Arithmetica*, treating of indeterminate analysis or

transcendental arithmetic, and containing, besides many new and curious theorems, a demonstration of the famous theorem of Fermat concerning triangular numbers. This gave him at once a distinguished place among scientific men. He was one of the first to calculate by a new method the orbit of the newly discovered planet Ceres, and afterward that of Pallas, for which he received from the French institute in 1810 the medal founded by Lalande. In 1807 he was appointed professor of mathematics and director of the new observatory at Göttingen, a position which he retained till his death. Having undertaken for the government of Hanover in 1821 the measurement of an arc of the meridian for trigonometrical purposes, he introduced important improvements in geodesy. To render the angles visible at as great a distance as possible, he invented the heliotrope, which accomplishes the object by reflecting the rays of the sun, and devised a method for the correction of the errors which occur in an extensive system of triangulation. After the arrival of Weber in Göttingen in 1831 Gauss employed his leisure principally in the investigation of magnetism. He invented the magnetometer for ascertaining the variations of the magnetic needle, and became member of the *Magnetischer Verein*, through the instrumentality of which valuable observations on terrestrial magnetism were made and the results published (6 vols., Göttingen, 1837-'48). His works mark an era in the history of science. As a mathematician he was pronounced by Laplace the greatest in Europe. Among the more important of his works are: *Theoria Motus Corporum Cælestium* (Hamburg, 1809; translated into English by C. H. Davis, Boston, 1857, and into German by Haase, Hanover, 1865); *Intensitas Vis Magnetica Terrestris* (Göttingen, 1833); *Atlas des Erdmagnetismus* (8 vols., Leipsic, 1840); *Dioptrische Untersuchungen* (Göttingen, 1841); and *Untersuchungen über Gegenstände der höhern Geodæsie* (1845-'7).

GAUTAMA. See BUDDHISM.

GAUTIER, Jean François Eugène, a French composer, born at Vaugirard, near Paris, in 1822. He became an excellent violinist, and produced many comic operas, the most successful of which, *Flors et Zéphire*, was performed at the Théâtre Lyrique in Paris in 1852.

GAUTIER, Théophile, a French author, born in Tarbes, Aug. 31, 1811, died in Paris, Oct. 23, 1872. He was educated at the college of Charlemagne, on leaving which he entered the studio of Rioult to study painting; but, discouraged at the feebleness of his first attempts, he turned to literature, and became an ardent disciple of the school of Victor Hugo. His first volume of poetry, published in 1830, was followed in 1832 by *Albertus*, a legend in verse. He then wrote a series of articles on the poets of the time of Louis XIII., which were collected and published in 1844 under the title of *Les grotesques*. In 1836 he began to write the articles on theatres and fine arts in the *Presse*, and

at the same time was a contributor to the *Revue de Paris*, the *Musée des familles*, and other publications. He also wrote numerous novels, poems, and books of travel. The most celebrated of his novels are *Mademoiselle de Mauvin* (1835), *Fortunio* (1838), *Les routes innocentes* and *Militona* (1847), *Le capitaine Fracasse* (1868), *La peau de tigre* (1865), *Spirite* (1866), and *Ménagerie intime* (1869). Besides the poems already mentioned, he published *La comédie de la mort* (1838) and *Emaux et camées* (1852). Among his books of travel are *Tra los Montes* (1848), *Zigzags* (1845), and *Constantinople* (1854). He made three visits to Russia by the invitation of the emperor Alexander II., and prepared, in collaboration with M. Richebourg, *Trésors d'art de la Russie ancienne et moderne*, published under the auspices of the Russian government (fol., with photographs, 1860-63). He wrote the librettos for the ballets *Giselle* (1841), *La Péri* (1848), *Gemma* (1854), and *Sacountala* (1858). His connection with the *Presse* as dramatic and art critic continued for 20 years, and at its end he became (1856) literary editor of the *Moniteur Universel*, and in 1869 of the *Journal Officiel*. His best critical articles were collected and published in 1859 under the title *Histoire de l'art dramatique en France depuis vingt-cinq ans* (6 vols.). He received a pension in 1868, but was repeatedly refused admission to the academy.—See *Théophile Gautier, souvenirs intimes*, by Ernest Feydeau (Paris, 1874).

GAVARNI, the pseudonyme of SULPICE GUILLAUME PAUL CHEVALIER, a French caricaturist, born in Paris in 1801, died at Auteuil, Nov. 23, 1866. He was employed by an engineer as draftsman at Tarbes, and borrowing a name from the village of Gavarnie in that region, subscribed it to sketches of the costumes and scenery of the Pyrenees. These brought him into notice, and he began the publication of the designs which made him celebrated. He first represented various types of eccentric life in Paris, and afterward attempted with equal success scenes of domestic life. Some of his series in the latter style were entitled *Les enfants terribles*, *Les fourberies de femmes*, *Les maris cengés*, *Les nuances de sentiment*, &c. Among the books which he illustrated were the *Juif errant* of Sue and the *Diable à Paris* of Balzac. His *Œuvres choisies*, with letterpress by Jules Janin, Théophile Gautier, Balzac, and others, were published in 1845 (4 vols.). Two volumes more appeared in 1850, under the name of *Perles et parures*. In 1869 was published *Manières de voir et façons de parler: recueil des écrits de Gavarni*, edited by Charles Yriarte; and in 1878 a *Catalogue des lithographies de Gavarni*, and *Gavarni*, a biography, by Edmond and Jules de Goncourt.

GAVAZZI, *Alessandro*, an Italian preacher and political agitator, born in Bologna in 1809. He joined the order of the Barnabites in 1825, and afterward officiated as professor of rhetoric at Naples. He was in Rome at the outbreak of

the revolution in Lombardy in 1848, delivered in the Pantheon a funeral oration on those who had fallen in that struggle, and made passionate appeals in behalf of the independence of Italy. The pope appointed him almoner of the Roman legion which was despatched to Vicenza, and he was called by the people the *Pietro Eremita*, or Peter the Hermit, of the national crusade. In Venice he addressed immense crowds in St. Mark's place, and thus gained means for furthering the movement. Pius IX., however, alarmed at the spread of the revolution, recalled his troops to Rome. Gavazzi repaired to Florence, and, after his expulsion from that city, to Genoa; but he was recalled to Bologna, where he was received with great enthusiasm by the people who had risen against the papal government. He was appointed by the republican government chaplain in chief of the army, and after the French occupation of Rome (July, 1849) he found an asylum in England, and subsequently lectured in Great Britain, the United States, and Canada, against the church and government of Rome. In 1851 he published in London his "Life, Sermons, and Lessons." He afterward returned to Italy, and in 1860 accompanied the expedition of Garibaldi to Sicily. In 1870 he again visited Great Britain, and in 1873 he solicited funds in the United States for the maintenance of Protestant churches in Italy.

GAVELKIND, a tenure in England by which the estate descends, not to the eldest son, as by common law, but to all the sons, or if there be no sons, to all the brothers. The word is said by some persons to be derived from the English words "given to all the kindred;" but other derivations are suggested. It prevails throughout the English county of Kent, but is seldom met with in other counties. The best authorities, including Selden, believe that this was the general custom of England before the Norman conquest.

GAVIAL, or *Garrhial*, a crocodilian reptile of Asia and Africa, of the genus *gavialis* (Geoffroy), characterized by its very long, straight, and narrow jaws, somewhat enlarged at the extremity. The number of teeth is greater than in other crocodilians, being 100 to 120 in all, from 50 to 60 in each jaw; the upper mandible is not pierced for the passage of the lower teeth, but has two grooves in each side for the reception of the first and fourth under teeth, the anterior being deep and in the front of the jaw; the five or six anterior pairs, both above and below, are larger than the rest of the teeth, the largest being the first, third, and fourth above, and the first, second, and fourth below, and all are of a conical form, slightly depressed from before backward. The division of the lower jaw into two branches begins about the 22d tooth of the series of 26. The bony opening of the nasal fossæ is triangular, and this is closed in the males by a large oval cartilaginous sac, whose cavity is supposed to serve as a reservoir of air when the animal plunges under

water. There are five toes on the fore paws and four on the hind, the middle three of the former being united at their base by a very short web, and the external three of the latter by a thicker and more extensive membrane covered with small granular scales; the nails are feebly curved. The nuchal plates are two, of large size and ridged, and oval form, sometimes with a small plate on each side of them; the cervical plates, four pairs, extend from the middle third of the neck to the dorsal covering in a longitudinal band, and are ridged on their median line; the upper part of the trunk is protected by four longitudinal series of ridged quadrilateral scales, each containing about 18, and the sides of the neck and flanks by flat smooth scales of medium size; the tail has from 84 to 40 circles of scales, becoming crested about the sixth or seventh on each side, the double portion becoming single and the highest near middle of the length; the under surface of the body is covered by about 60 transverse rows of smooth, oblong, quadrilateral scales, each pierced on the posterior border by a small open-

fossil crocodiles which existed toward the end of the secondary epoch all had the elongated jaws of the gavial, the true crocodiles not appearing until the tertiary period at the same time with their mammalian prey. The *crocodilus priscus* of Sömmering, the *telosaurus* and the *stenosaurus* of Geoffroy, all had the cranial characters of the gavial. This reptile, though now confined to the warmest regions, in former geological ages lived in northern Europe.

GAY, Claude, a French traveller and naturalist, born at Draguignan, March 18, 1800. After having studied the natural sciences at Paris and travelled in Greece and the East, he went to Chili in 1828 and studied the botany, zoölogy, and meteorology of that country, and also of parts of Peru, Brazil, and Buenos Ayres. After his return to Paris in 1842 he published in Spanish, at the expense of the Chilean government, his great work, the *Historia física y política de Chile* (Paris, 1848-'51), in 24 vols., besides an atlas in 2 large 4to vols., composed of 815 plates.

GAY, Delphine. See **GIRARDIN**.

GAY, Ebenezer, an American clergyman, born in Dedham, Mass., Aug. 26, 1696, died March 18, 1787. He graduated at Harvard college in 1714, and was in 1718 settled over the church at Hingham, Mass., where he remained till his death. On his 85th birthday he preached a sermon from the text: "Lo, I am this day fourscore and five years old," which, under the title of "The Old Man's Calendar," has been frequently republished in America, went through several editions in England, and was translated into one or two of the continental languages of Europe. In theology he was liberal. John Adams said, on the first distinctive announcement of Unitarianism in this country, that he had heard the doctrine from Dr. Gay long before. He published several volumes of sermons.

GAY, John, an English poet, born near Torrington, Devonshire, in 1688, died in London, Dec. 4, 1732. After receiving an elementary education at the grammar school of Barnstaple, he was apprenticed to a silk mercer in London, but soon abandoned this business for literary pursuits. In 1711 he produced his poem "Rural Sports," which he dedicated to Pope, and a lifelong friendship sprung up between the two poets. In the following year he became secretary to the duchess of Monmouth. His next work, "The Shepherd's Week," was written to throw ridicule on the pastorals of Ambrose Philips, and met with great success. In 1713 he brought out a comedy called "The Wife of Bath," which was acted only three nights. In 1714 he accompanied the British ambassador, Lord Clarendon, to Hanover as secretary. On the death of Queen Anne, however, he was dismissed from office, and driven once more to use his pen as a means of support. Soon after returning to England he produced a drama entitled "What d'ye Call It?" which was so well received that he made another attempt of a

Gavial or Gangetic Crocodile.

ing. The scales of the limbs are rhomboidal, and on the posterior ones from the ham to the little toe furnished with a serrated crest. The common species, the gavial of the Ganges (*G. Gangeticus*, Geoff.), is of a deep sea-green color above, with numerous irregular brown spots, smallest and thickest about the jaws, and below pale yellowish white; the young have the back and limbs banded with black. It attains a length of over 20 ft., though the specimens usually seen are considerably smaller than this; in the adult the head is a little less than one fifth, and the tail about one half of the total length of the animal. Though most common in the river Ganges, it is found in other rivers of Asia; and other species have been described from Africa. Notwithstanding its large size and numerous teeth, the gavial feeds on fishes and small prey; the narrowness and feebleness of the jaws do not enable it to seize large land animals, like the wide and stronger jawed crocodile and alligator. The general structure and habits of the gavial do not differ essentially from those of the crocodile.—The

similar nature, in which he is said to have been assisted by Pope and Arbuthnot. Owing to its personality and indelicacy, his "Three Hours after Marriage" proved a decided failure, and involved its author for a time in disgrace. In 1727 his celebrated "Beggars' Opera" was brought on the stage, and was represented for 62 successive nights, four of which were for his own benefit, and yielded him nearly £700. This piece was followed by another opera entitled "Polly;" but the lord chamberlain forbade its representation, and Gay was constrained to publish it by subscription, by which he realized £1,100 or £1,200. The most important of his other works are "Trivia, or the Art of Walking the Streets of London," and his "Fables," which are among the best of their kind in the language. Of his minor poems, the ballads of "Black-eyed Susan" and "'Twas when the Sea was Roaring" are the most popular. Gay was at one time rich, but he lost nearly all his property by the bursting of the South sea bubble. His latter days were spent in the house of the duke of Queensberry. The prominent characteristics of his poetry are wit, simplicity, and sweetness. The best edition of his poetical works is that of W. Coxe (8 vols., London, 1797; 2 vols., 1806); the best edition of his "Fables," that of O. F. Owen (London, 1856).

GAY, Marie Françoise Sophie, a French novelist, born in Paris, July 1, 1776, died March 5, 1852. She was the daughter of a French financier named Nichault de la Valette, and was married in 1798 to M. Liottier, from whom she was divorced in 1799. She then became the wife of M. Gay, receiver general of finance in the department of Roer, under the empire, and accompanied him to Aix-la-Chapelle, its capital, where she resided ten years. She was remarkable for her wit, agreeable manners, and social disposition, and her house at Aix-la-Chapelle, at Paris after her return thither, and at Versailles, where she passed the last few years of her life, was the resort of literary and fashionable society. As early as 1802 she published anonymously in the *Journal de Paris* an article upon Mme. de Staël, and in the same year her first novel, *Laure d'Estell*, which had a moderate success. In 1813 she published *Léontis de Montbreuse*, considered one of her best novels; in 1815, *Anatole*, which narrates the loves of a deaf mute; and in 1818, *Les malheurs d'un amant heureux*, a lively picture of manners during the empire. She continued to produce books until a few years before her death, among them *Les souvenirs d'une vieille femme*, a piquant abstract of her personal memoirs. She wrote unsuccessfully for the stage.

GAY, Sydney Howard and Winckworth Allan. See supplement.

GAYA, a town of Bengal, British India, in the district of Behar, 265 m. N. W. of Calcutta; pop. about 40,000. It consists of two parts, the old town, in which the Brahmans reside, and the new town, inhabited by the secular

population and Europeans. The old town is well built, but the streets are narrow, filthy, and hardly passable. There are numerous shrines and places of pilgrimage, visited by devotees from all parts of India. The Phalgu, a tributary of the Ganges, flows through the town, and is deemed a sacred stream. The most revered structure here is the temple of Vishnu, erected by a Mahratta princess, 82 ft. in length, and crowned by an octagonal pyramid more than 100 ft. high. In the immediate vicinity are the ruins of Buddha-Gaya, supposed to have been the scene of the birth of Buddha, whence the sanctity of the existing town is derived. The new town has wide and straight streets, with a row of trees and foot walks on each side; but the houses for the most part are mere mud-built huts.

GAYANGOS, Pascual de, a Spanish orientalist, born June 21, 1809. He studied at Paris under Sylvestre de Sacy, travelled through northern Africa in 1828, married an English lady at Algiers, and was from 1831 to 1836 interpreter to the ministry of foreign affairs in Paris. He afterward resided several years in England. He translated into English Al-Makkari's "History of the Mohammedan Dynasties of Spain" (2 vols. 4to, London, 1840-'48). Prescott was indebted to Gayangos for materials for his historical works. In 1848 he was appointed professor of Arabic in the university of Madrid. He made with H. Vedia a Spanish translation of Ticknor's "History of Spanish Literature," to which he added copious notes (Madrid, 1851-'6). Among his other publications are critical editions of the *Gran conquista de Ultramár*, of the *Libros de caballería*, and of the *Escritores en prosa anteriores al siglo XV*. His most recent works are *Cartas del cardinal Cisneros* (Madrid, 1867), and *Cartas y relaciones de Hernán Cortés al emperador Carlos V.* (Paris, 1870).

GAYARRÉ, Charles, an American historian, born in Louisiana, Jan. 9, 1806. He was educated at the college of New Orleans. In 1825, the draft of a criminal code having been laid before the state legislature by Edward Livingston, Gayarré published a pamphlet in which some of its provisions were ably canvassed. He studied law at Philadelphia, was admitted to the bar in 1829, and returned to New Orleans. An *Essai historique sur la Louisiane* (2 vols. 12mo), which he published at that time, attracted attention, and he was soon elected to the state legislature. The next year he was appointed deputy attorney general of the state, and in 1833 presiding judge of the city court of New Orleans. In 1835 he was elected to the United States senate, but impaired health prevented his taking his seat, and he went to Europe, where he remained for nearly eight years. In 1844 he again entered the state legislature, and was reelected in 1846. He was appointed secretary of state, and retained the office for seven years, after which he retired from public life. His histori-

cal works comprise the *Histoire de la Louisiane* (2 vols. 8vo, New Orleans, 1847); "Romance of the History of Louisiana" (12mo, New York, 1848); "Louisiana, its Colonial History and Romance" (8vo, New York, 1851); "Louisiana, its History as a French Colony" (2 vols. 8vo, New York, 1851-'2); and "History of the Spanish Domination in Louisiana, from 1769 to December, 1803" (New York, 1854). He is the author of "Philip II. of Spain," a biography (New York, 1866), and of a novel, "Fernando de Lemos, Truth and Fiction" (1872), which is to be followed by a sequel entitled "Aubert Dubayet." He has also published a drama, "The School for Politics," and several literary and political addresses, among which are two lectures on "The Influence of the Mechanic Arts."

GAY-LUSSAC, Joseph Louis, a French chemist, born at St. Léonard, Limousin, Dec. 6, 1778, died in Paris, May 9, 1850. He was educated at the polytechnic school of Paris, then called *l'école centrale des travaux publics*, where he attracted the notice of Berthollet, and was employed by him for a short time in the laboratory of the government chemical works at Arcueil. He then returned to the polytechnic school as assistant professor. Observations made on balloon ascensions having led to the supposition that the magnetic force diminishes at great elevations above the surface of the earth, Gay-Lussac and Biot were commissioned by the institute to make experiments with reference to it. Two ascensions were made, the first, Aug. 23, 1804, by both, and the second, Sept. 15, by Gay-Lussac alone. In the latter he reached the extraordinary height of about 23,000 feet. These ascensions were the first made for exclusively scientific purposes. Their results were not conclusive, but interesting observations were made upon the decrement of temperature with the increase of elevation, and upon the uniformity in the composition of the atmosphere at all heights. On Oct. 1 of the same year Alexander von Humboldt and Gay-Lussac submitted to the French academy a joint paper upon the combination of gases, especially of oxygen and hydrogen, which attracted much attention and marks an era in the progress of chemical science. In 1805-'6 Gay-Lussac prosecuted in company with Humboldt scientific inquiries in France, Switzerland, Germany, and Italy. They were present at Vesuvius when there was an eruption and an earthquake. Their observations on terrestrial magnetism were published in the *Mémoires de la société d'Arcueil*. Gay-Lussac began in 1807 to investigate the expansion of the air and gases under increased temperatures, and established the law that when free from moisture they all dilate uniformly and to equal amounts for all equal increments of temperature, at least between zero and 100° C. He also showed that the gases combine in simple proportions of their volumes, and that the contraction sometimes experienced when sev-

eral of them are compounded is always an exact simple fraction, usually one half, one third, or one quarter of their joint bulk. Sir Humphry Davy having shown by means of the voltaic pile that potassium and sodium are not simple substances, as had previously been supposed, and having decomposed them by the same means, Gay-Lussac and Thénard obtained potassium and sodium in greater proportions even than they had been obtained by Davy himself. They also developed the compound character of boracic and fluoric acids, introduced new methods of analyzing organic substances by their combination with chlorate of potash, and elucidated the composition of many of these compounds. The results of their investigation were given in *Recherches physico-chimiques sur la pile, sur les alcools, &c.* (2 vols. 8vo, 1811). Gay-Lussac afterward made original researches of great value into the newly discovered elementary substances of iodine and cyanogen, into Prussian blue, chloric and hydrosulphuric acids, the theory of vapors, capillary attraction, and other subjects. Their results were published in the *Annales de chimie et de physique*, which he edited with Arago, and in other publications. In 1816 he invented the siphon barometer, since modified by Bunsen, by whose name it is best known. He also invented instruments for estimating the quantities of alcohol, chlorine, and alkali present in solutions, known severally as the alcoholometer, chlorometer, and alkalimeter. In 1832 he gave up the professorship at the Sorbonne, to which he had been appointed in 1809, and accepted that of general chemistry at the *jardin des plantes*. As an expounder of science he was distinguished for the clearness of his explanations. In 1831 he was chosen by the electors of his native town member of the chamber of deputies; and in 1839 he was made a peer of France.

GAZA (Arab. *Ghazze* or *Ghuzze*), a town of Syria, built partly on a steep hill, partly on the plain below, on the road leading to Egypt, between the Mediterranean and the desert; pop. about 15,000. It is situated about 3 m. from the sea, in the neighborhood of rich gardens, is not fortified, and consists partly of mud cottages, partly of ruinous stone buildings, which are occupied by the government and chief citizens. It is an important entrepot for the caravan traffic between Egypt and Syria. It has few relics of antiquity, and its only interesting edifice is a mosque which was originally a Christian church, founded, according to tradition, by the empress Helena.—The ancient city of Gaza, which some suppose to have stood nearer the sea, is known in the Bible as the most southern of the five confederate cities of the Philistines, and is often mentioned, as in the history of Samson. Its Hebrew name (*Azzah*) signifies "strong." On the conquest and division of Palestine by the Israelites, it was allotted to the tribe of Judah, which conquered it, but lost it again. It

shared in the wars of the Philistines with the Hebrews. Having become a possession of Persia, it was taken after an obstinate siege by Alexander the Great (332 B. C.); nearly all its inhabitants perished during the assault, and its commander Batia, at the conqueror's order, was dragged around the walls at the wheels of a chariot. After Alexander's death it was taken by Antigonus, and witnessed the defeat of Demetrius Poliorcetes by Ptolemy (812). After the restoration of Jewish independence by the Maccabees, it was several times assaulted, besieged, and taken by the princes of that house. The Romans ceded it to Herod the Great. Under Nero it was taken by the revolted Jews. Constantine restored its ancient splendor, made it a bishopric, and gave it the name of Constantia, with various privileges. These were abolished by Julian the Apostate, and restored by his Christian successors. The Arabs took it in 634, two years after the death of Mo-

Peripatetic, and devoted himself to translating from the works of Aristotle, Theophrastus, and Hippocrates into Latin, and from those of Cicero into Greek, and was also the author of a treatise on the Attic months, of a book on the origin of the Turks, and of a Greek grammar, which was published at Venice and often reprinted. After assisting at the council of Florence in 1439, he taught Greek at Ferrara by the invitation of the duke, and founded there an academy. In 1450 he was called by Pope Nicholas V. to Rome. He afterward lived at Naples under the patronage of Alfonso the Magnanimous, and at Rome under that of Cardinal Bessarion.

GAZEL, or *Ghazel*, a kind of lyric poem, consisting of from 5 to 17 stanzas of two lines each, all the second lines of which rhyme together. It is a favorite form in the poetry of the Turks and the Persians, and may be called the sonnet of the East. The last couplet al-

ways contains the real or assumed name of the author. The subjects treated in the *ghazel* are either erotic and bacchanalian, or allegorical and mystical. Hafiz excels in this form of the lyric, and imitations of it have been made in German by Platen, Rückert, and others.

GAZELLE, the type of a group of the antelope family (see **ANTELOPE**), of beautiful form, small size, and graceful carriage. Both sexes are provided with horns, nearly over the orbits, annulated and striated, nearly vertical, and bending outward and at the top inward in a

Gaza.

hammered. The crusaders captured it in 1100, and from them it was wrested by Saladin. In the 18th century it witnessed the defeats of the Christian armies by the Kharezmians and of the emir of Damascus by the Egyptians, and in 1516 that of the Mamelukes by the Turks. In 1771 it was seized by the revolted Ali Bey, and in 1799 by the French under Kléber.—Another Gaza (correctly, *Gazaca*) was in Media Atropatene, a summer residence of the Median kings. Ruins of it are seen between Miana and Tabriz.

GAZA, *Theodore*, one of those learned Greeks who contributed to the revival of letters in Italy, born in Thessalonica about 1400, died in Abruzzo in 1478. After the capture of his native town by the Turks in 1480 he fled to Italy, where he introduced a more exact knowledge than had before existed of the two principal philosophers of antiquity. He was a

lyrate form, and of a black color; the shape of the ancient lyre is said to have originated from using in its construction the horns and the frontal bone of antelopes, the strings being passed from a cross bar at their tips to a second fastened across the orbits; the bony core of the horn is solid. They have a small lachrymal sinus, inguinal pores, generally tufts upon the knees, a short dark-tufted tail, and two or four mammae; the darker color of the sides is separated from the white of the abdomen by a very dark band; the eyes are prominent, dark-colored, with a soft and gentle expression; the nose is ovine. They are gregarious, inhabiting the open and barren plains of northern Africa and western Asia, shy and difficult of approach, and extremely swift. The common gazelle, or Barbary antelope (*gazella dorcas*, H. Smith), the *gazal* of the Arabs, is generally supposed to be the *δορκάς* of Ælian and the *trebi* of the

Scripturae. It is a little less than the roebuck in size, with round, black, lyrate horns, about 18 in. long, with 12 or 13 bars, and sharp points turned forward; the general color is pale fulvous, extending down the front and outside of the limbs; the lips, nose, buttocks,

appears to be one or the other of the preceding species. Other gazelles are the m'hor of Mr. Bennett, the nanguer of F. Cuvier, and the ariel or cora, which are also supposed by many to be varieties of the *G. dorcas*. Sömmering's gazelle (*G. Sömmeringii*, Rüpp.) is a very beautiful and delicate creature, about



Common Gazelle (*Gazella dorcas*).

under parts, and inside of legs white; a rufous tint on the forehead, blackish in the middle, and white and black streaks on the nose; eyes large, black, and lustrous. The horns in the female are more slender, and the points are turned inward; the mammae are two. This species seems to be confined to the N. side of the Atlas mountains, Egypt, Abyssinia, Syria, Arabia, and S. Persia. They feed generally at dawn and at evening, approaching water, it is said, only once in 24 hours; they are hunted in various ways, and their flesh is excellent; they furnish food to great numbers of carnivorous animals. The kevel (*G. kevela*, H. Smith) is by some considered a mere variety of the common gazelle; it is about the same size, but the head is longer, the horns are

Sömmering's Gazelle (*Gazella Sömmeringii*).

2½ ft. high at the shoulder; the color above is a reddish-gray isabella color, the buttocks, lower parts, and inside of the limbs white, and the median line of the forehead to the nose brownish black; it inhabits N. E. Africa.

GEAUGA, a N. E. county of Ohio, drained by the sources of Cuyahoga, Grand, and Chagrin rivers; area, about 480 sq. m.; pop. in 1870, 14,190. It has an undulating surface, admirably adapted to pasturage. Sandstone and iron are abundant. The chief productions in 1870 were 64,815 bushels of wheat, 179,319 of Indian corn, 337,686 of oats, 185,781 of potatoes, 498,180 lbs. of flax, 377,941 of maple sugar, 105,811 of wool, 619,742 of butter, 458,834 of cheese, and 39,160 tons of hay. There were 4,622 horses, 18,674 milch cows, 7,267 other cattle, 19,818 sheep, and 4,344 swine; 6 manufactories of saddlery and harness, 12 of carriages and wagons, 8 of boxes, 27 of cheese, 4 flour mills, and 8 saw mills. Capital, Chardon.

GÉBELIN, Court de. See COURT DE GÉBELIN.

GERER, Abu Musa Jafar al-Safi, founder of the school of Arabian chemists about the close of the 8th century, born in Thus, Persia, or, according to Abulfeda, in Harran, Mesopotamia. He is reckoned by Cardan as one of the twelve subtlest geniuses of the world, and his authority was unrivalled among the alchemists of the middle ages. His works, only fragments of which remain, contain the germs of the belief in the transmutation of metals, and in the universal elixir, which he thought to be a solution of gold. They also contain curious and useful details concerning the nature, fusion, purification, and malleability of metals. They have all been translated into Latin (Dantzig, 1682), and into English by Russell (London, 1678).

GEBWEILER (Fr. *Guebwiller*), a town of Germany, capital of a circle of Upper Alsace,

Kevel (*Gazella kevela*).

more robust and longer, the orbits larger, the eyes fuller, and the geographical distribution to the south of the Atlas; the habits and general disposition of the colors are the same as in the common gazelle. The corinna, found in central Africa and described by Adanson,

situated on the Lanch in a valley of the Vosges mountains, 15 m. S. W. of Colmar; pop. in 1871, 11,888. It has three gates, a fine promenade, two handsome churches, and many Swiss chalets and pleasant cottages on the slopes of Mount Gebweiler, the culminating point of the Vosges (4,700 ft.). There are manufactories of cloth, cotton goods, ribbons, chemical products, machinery, and other articles. Previous to the Franco-German war it belonged to the French department of Haut-Rhin.

GECKO, a name applied to a family of nocturnal lizards (*ascalabotes* of Duméril and Bibron), numerous in species, living in warm climates, and presenting characters of form, structure, and habits which make the group as distinct as that of the crocodiles or chameleons. Their size is small; the head wide, flattened, covered with scales, with marginal scuta at each jaw; the neck short; the body depressed, stout, thickest in the middle, without crest on the back, generally covered with small imbricated scales and scattered tubercles, smallest on the back; the tail moderate; the feet five-toed, the thumb often very short, and the other fingers equal, flattened below and lobed at the end; the tongue is fleshy, short, slightly protractile, free and scarcely emarginate at the tip; the eyes very large, covered as in serpents by a transparent immovable lid, behind which these organs have free motion; the pupil vertical, and often linear as in nocturnal animals generally; the opening of the ear is distinct, and the tympanum depressed; there are no teeth on the palate, those of the jaws thin, entire, numerous, with cutting edges, and adhering to the internal margin; femoral pores occasionally present, but usually absent; besides the leaf-like expansion at the end of the toes, nails are generally present, capable of retraction, as in the cats, the latter favoring their progression in climbing on smooth surfaces. The tail is shorter than in ordinary lizards, and the flatness and width of the head give them somewhat the aspect of salamanders; the mouth is deeply cleft, and the widely expanded jaws may be kept open for a long time, the cavity of the mouth being shut off from the throat by the application of the base of the tongue to the posterior part of the palate; from the shortness of the robust legs, the abdomen touches the ground in walking. This reptile is mentioned by Aristotle, and the modern name gecko is derived from the sound made by some of the Indian species, resembling the click of the hostler urging on his horses, and was first given by Laurenti; this genus was the *ascalabotes* of Aristotle, the *stellio* of Pliny, and the *tarentola* of the ancient Italians. Their colors are generally gray or yellowish, but some have brighter tints which can be varied like those of the chameleon, probably by the same changes in the reflecting surface of the integuments; the sides of the body, limbs, and tail are sometimes fringed with membranes. In many species there is a line of pores along and under

the thighs, from which a fatty moisture distills; some species of a genus will have these, and others not, and sometimes one sex only will be destitute of them. The tail, as in salamanders, is ruptured with facility, and is reproduced readily, often in a deformed manner. Their food consists of larvæ and insects, which they pursue into their leafy retreats; the imbricated plates on the bottom of their feet, like those of the tree frog and flies, enable them to climb smooth walls and similar surfaces, and to adhere to them with the back downward; by means of their sharp, curved, retractile claws, they can ascend trees and rough objects with ease and rapidity; from the quickness of their movements, their suddenly becoming motionless, and remaining so for a long time, and their resemblance to the colors of the substances on which they are placed, they are difficult to obtain, and not easy even to see; they hunt for food both by night and day; the same qualities which fit them for the pursuit of living prey enable them to escape their bird enemies. These reptiles are objects of horror and repugnance, from the erroneous idea that they exude a poison so powerful and subtle that their touch, a drop of their saliva, or a scratch with their nails, will produce leprosy and other cutaneous diseases, often ending fatally. They like to approach human habitations, as there they find in greatest abundance their insect food; their ill-shaped body, smooth or spiny, dull colors, large head, their enormous staring eyes, rapid and silent motions, and familiarity in houses, render them very disagreeable, but by no means dangerous inmates. Found in all warm climates, they are very uncommon in Europe (two or three species), and most abundant in Asia, America, and Africa, and the Pacific islands are well supplied with them. They have been divided into genera according to the form and structure of their toes; but these generic characters in a family so nearly alike in its members are very unsatisfactory, and great and unnecessary multiplication of genera has been the result of the labors of various systematists. The arrangement of Duméril and Bibron, which differs but little from that proposed by Cuvier in 1829, is as follows: 1. *Platydictylus* (Dum. and Bibr.), with toes enlarged for their whole length, with finely plicated striæ beneath; of those species having the feet cloven, some have all the toes unarmed, others all unguiculate, others with the thumb only or with the second and third fingers unarmed; of those with palmated feet the fingers are either all unguiculate, or the thumb alone is unarmed; there are about 20 species, of which the varieties have been made into genera by Fitzinger, Wiegmann, Kuhl, and others. 2. *Hemidactylus* (Cuv.), with the toes widened only at the base into an oval disk striated beneath; about 15 species. 3. *Ptyodactylus* (Cuv.), with the toes enlarged at the extremity into a cleft oval disk, striated below like a fan, and all armed with

claws; destitute of femoral pores; four described species. 4. *Phyllodactylus* (Gray), with the terminal disk as in the last genus, except that two plates take the place of the fan-like striæ; eight species. 5. *Sphæriodactylus* (Cuv.), small species, with the toes ending in a single, simple, smooth cushion; nails absent, as well as femoral pores; three species. 6. *Gymnodactylus* (Spir.), with toes not widened, but striated beneath; 12 species. 7. *Stenodactylus* (Fitz.), with simple toes, granulated below, and all provided with nails; with a single species.—As specimens of this animal the following may be mentioned: The wall gecko (*Pl. muralis*, Dum. and Bibr.; *Pl. facetanus*, Aldrov.) is 6 in. long, of a grayish color, the

Mediterranean, is about 5½ in. long, of a reddish gray color, spotted with white and pale brown, and whitish below; it is common in the damp and gloomy parts of houses, and is called at Cairo "father of leprosy," from the belief that it communicates this disease to persons who partake of food over which this animal has walked, the poison being supposed to exude from the lobes of the toes. The truth is, that neither its bite nor any of its secretions are hurtful to man or beast; cats pursue it and eat it eagerly. The Egyptians are said to keep it from their kitchens by large quantities of garlic. The flat-tailed gecko (*G. phyllurus*, Dum. and Bibr.) has the tail flattened like a leaf, and the upper part of the body rough with spines; it is a native of Australia, and is about 9 in. long, dark gray, marbled with blackish above, and whitish beneath.

GED, William, a Scottish mechanic, the inventor of stereotyping, born in Edinburgh about 1690, died Oct. 19, 1749. He was originally a goldsmith in his native city, and is said to have first attempted stereotyping in 1725. In 1729 he entered into partnership with William Fenner, a London stationer, in order to carry his invention into regular practice, Fenner advancing the necessary capital on condition of receiving half the profits. Other partners subsequently joined the firm. In 1731 the company contracted with the university of Cambridge for the printing of Bibles and prayer books by stereotype, and invested a large sum of money in the enterprise; but when only two prayer books were finished the contract had to be surrendered, owing, as Ged alleged, to the malignant mismanagement of the pressmen, who were hostile to the innovation, and the disreputable conduct of some of his associates. In 1733 he returned to Edinburgh, where in 1736 he completed an edition of *Sallust*, which was not published till 1744, and was inaccurately executed. Ged died in poverty.

GEDDES, Alexander, a Scottish Roman Catholic ecclesiastic, born in Arradowl, Banffshire, Sept. 4, 1737, died in London, Feb. 20, 1802. He was educated at the Scotch college in Paris, where he distinguished himself as a theologian and linguist. In 1769 he was appointed pastor of a Catholic congregation at Auchinhalrig in his native county. In 1780 he removed to London with the intention of commencing a new translation of the Bible for the use of English Catholics; and under the patronage of Lord Petre, who allowed him £200 a year, and provided him with all the necessary authorities, he applied himself to his work. His original design was to make the Vulgate the basis of his translation, but he soon abandoned this idea, and substituted the Hebrew and Greek versions in its stead. The 1st and 2d volumes of this translation appeared in 1792 and 1793; the 3d, which was merely a commentary on the Pentateuch, in 1800; the rest of the work was never published. This translation is considered to have contributed in a considerable

Common Gecko (*Platydictylus guttatus*).

upper part of the body and head rough; this species occurs all around the Mediterranean, and conceals itself in walls and stone heaps, delighting to cover itself with dirt and filth; it likes the heat of the sun, and, though beneficial in houses by destroying insects and vermin, is generally feared and persecuted, like the toad and other useful creatures. The common gecko (*Pl. guttatus*, Cuv.) of the continent of Asia and its archipelago is 11 in. long, of which the tail is about half; the general color is dark gray, with whitish spots. A common gecko in the walls of houses in the West

Hemidactylus mabouia.

Indies is the *H. mabouia* (Cuv.), about 5 in. long, of a grayish color marbled with brown, with the posterior half of the tail ringed with black. The house gecko (*Pt. Hasselquistii*, Dum. and Bibr.), found in Egypt, Arabia, and countries bordering on the eastern part of the

degree to the advancement of Biblical criticism. The commentary was written in the spirit of the rationalistic school of Germany, and was favorably regarded by Paulus and Eichhorn, the principal writers of that school. Immediately after the publication of his commentary, the reading of his work was forbidden to the faithful, and the author was deposed from the priesthood. He was the author of several poems and translations, among which was an imitation of the satires of Horace, which had extraordinary success. A life of Geddes, with a catalogue of his works, was written by Dr. John Mason Good (1 vol. 8vo, London, 1808).

GEEFS, Guillaume, a Belgian sculptor, born in Antwerp, Sept. 10, 1806, died May 10, 1860. After completing his studies he went to Paris, where he spent some time in the studio of M. Ramey. Soon after returning to Belgium he obtained a commission from the Belgian government to execute a monument to the memory of the victims of the revolution of 1830. He also produced "Geneviève de Brabant," "Francesca da Rimini," "Fisherman's Daughter," "Infant St. John," &c., and executed a statue of Rubens, a colossal marble statue of King Leopold I. for the vestibule of the national palace, and a monumental statue of Charlemagne.—His brother **JOSEPH**, born in 1808, also a sculptor, distinguished by the same qualities, has executed among other works "Adonis departing for the Chase" and an equestrian statue of Leopold I. Their brother **ALOYS**, born about 1816, gave promise of great excellence as a sculptor, but died in 1841.

GEELONG, a city of Victoria, Australia, near the head of Corio bay or Geelong harbor, the W. arm of Port Phillip bay, 45 m. S. W. of Melbourne, with which it is connected by railway; pop. in 1871, 14,897. It is built on ground sloping to the bay; the streets are wide and well paved and drained, and the houses are mostly of brick and stone. The principal buildings are the hospital and benevolent asylum, the chamber of commerce, the mechanics' institute, the clock tower, the grammar school, the court house, the post office, several of the hotels, the churches, and the banks. There is an extensive botanical garden. The town is lighted with gas, and is supplied with water from the river Barwon. The surrounding country is beautiful, the soil fertile, and the climate healthy. There are four jetties in Corio bay, at which large ships can load and discharge, and the commerce in wool, tallow, gold dust, &c., is important. Three newspapers are published.—Geelong was first settled in 1837, and was incorporated in 1849. It first assumed importance after the discovery of gold at Ballarat, 48 m. N. W., in 1851, and for a time promised to become the principal seaport of southern Australia; but the construction of the railway from Melbourne to this point and thence to Ballarat diverted the produce of the interior to Melbourne.

GEEER, Karl de, baron, a Swedish naturalist, born at Finspang, Feb. 10, 1720, died in Stock-

holm, March 8, 1778. He studied at Utrecht and Upsal, was a pupil of Linnæus, and published *Mémoires pour servir à l'histoire des insectes* (8 vols. 4to, Stockholm, 1752-'78), containing descriptions of more than 1,500 species, accompanied with excellent illustrations. To this the *Genera et Species Insectorum* of Retzius (Leipsic, 1783) may be regarded as a supplement. De Geer also published several other zoölogical works. He inherited from an uncle a very large fortune, which he employed in benevolent and useful enterprises.

GEERTS, Charles Henri, a Belgian sculptor and wood carver, born in Antwerp in 1808, died in 1855. He was professor at the academy of Louvain. Among his principal works are "Christ sinking under the Weight of the Cross," in Leyden; a Madonna in the museum of Brussels; the "Mater Dolorosa" and "St. John" in Bristol. At the great exhibition of 1851 he gained a prize medal for his chief contribution, the "Coronation of the Virgin."

GEESTERMÜNDE, a seaport of Prussia, in the province of Hanover, at the confluence of the Geeste and Weser, separated by the Weser from Bremerhafen; pop. in 1871, 3,219. It was established by the government of Hanover as a rival of Bremerhafen, was made a free port in 1847, and in 1862 extensive harbor works were commenced. Since the annexation of Hanover to Prussia, Geestermünde has been made a station of a part of the German fleet. The place possesses some advantages, which will probably render it an important port.

GEEZ. See ETHIOPIA, LANGUAGE AND LITERATURE OF.

GEFFRARD, Fabre, a mulatto soldier and president of Hayti, born at L'Anse-Veau, Sept. 19, 1806. His father, Nicholas Geffrard, was a general of the war of independence and one of the framers of the national constitution. Fabre entered the army in 1821. After the downfall of President Boyer in 1842 he rapidly rose in rank and consideration, and became general of division in 1845, to which rank Soulouque on becoming emperor in 1849 added a ducal title. Geffrard's popularity increased in proportion to the decline of that of his master, and at the end of 1858 he led the revolution against him, proclaiming his deposition at Saint-Marc. While the emperor was marching toward that place with a considerable force, Geffrard succeeded in outwitting him, and in entering Port-au-Prince Jan. 15, 1859. He banished Soulouque to Jamaica, and being at once chosen as president, he marked his accession by acts of clemency and by salutary reforms, declining to accept the absolute power offered him. Those who had benefited by previous abuses now conspired against him, together with the minister of the interior, Guerrier-Prophète, and instigated an attempt upon his life (Sept. 8), which resulted only in the assassination of his daughter, who had just been married. The minister and two accomplices were sentenced to death in their absence; 16

others were executed, and a few were pardoned or imprisoned. In 1861 his popularity was impaired by what was denounced as his subserviency toward Spain on its taking possession of the Dominican republic; and intestine commotions being set on foot on various pretexts, outbreaks became henceforward habitual occurrences, which were suppressed and many of their leaders executed. In 1864 Salnave headed an insurrection in the N. part of Hayti, which had belonged to Dominica. This movement being put down and Salnave outlawed, he enlisted soldiers in the adjoining republic and proclaimed a provisional government of the Cape district in May, 1865. In November this was overthrown with the aid of the English, with whose rights it had interfered, and Salnave took refuge on board an American man-of-war. In July, 1866, he led a new outbreak at Gonaïves, which was once more put down. To reconcile the people, who began to compare him with Soulouque, Geffrard abolished capital punishment for political offences; but the revolution continued and increased in strength till Salnave gained possession of the capital, March 13, 1867, and Geffrard was obliged to take refuge in Jamaica.

GEFLE, a seaport town of Sweden, capital of the län of Gefleborg, situated near the gulf of Bothnia and the mouth of the river of its name, 92 m. N. N. W. of Stockholm. It formerly contained a population of about 13,000, and was one of the handsomest towns in Sweden, but in 1869 it was almost totally destroyed by fire. The chief manufactures are tobacco, linen, sail cloth, cards, and leather. There are two ship yards.

GEHENNA (Heb. *Ge-Hinnom*, the vale of Hinnom), a valley adjacent to Jerusalem, on the south and southwest, also called Tophet, and often mentioned in Scripture in connection with the idolatrous rites of Moloch, which were there celebrated. From the abhorrence with which the Jews after the captivity regarded this worship, the valley was made the common sewer of the city, and a receptacle for all its refuse, which was there consumed by fire. In the New Testament the name is transferred by an easy metaphor to hell.

GEIBEL, **Emanuel**, a German poet, born in Lübeck, Oct. 18, 1815. He became associated in 1836 at Berlin with Chamisso, Gaudy, and Kugler, and was professor of æsthetics in the university of Munich from 1852 to 1868. Of his *Gedichte und Gedankenblätter*, the 9th edition appeared in 1868; of his *Neue Gedichte*, the 12th, and of his *Juniuslieder*, the 18th, in 1870; of his *Gedichte*, the 69th in 1871; and of his political poems, *Heroldsrufe*, the 4th in 1871. His principal dramatic poems are *Brünhild* (1857) and *Sophonisbe* (1868).

GEIGER, **Abraham**, a German rabbi, orientalist, and Biblical critic, born in Frankfort, May 24, 1810, died Nov. 13, 1874. He studied at the universities of Heidelberg and Bonn, gaining in the latter the prize for a dissertation on

the Hebrew sources of the Koran. In 1832 he became a rabbi at Wiesbaden, in 1838 at Breslau, in 1863 at Frankfort, and in 1869 at Berlin, which position he held till his death. His efforts to effect reforms in Judaism rendered him one of the most conspicuous Jewish theologians in Europe. From 1835 to 1847 he edited the *Zeitschrift für jüdische Theologie*, and in 1862 he started the *Jüdische Zeitschrift für Wissenschaft und Leben*. The most important of his writings are: *Lehr- und Lesebuch zur Sprache der Mischna* (Breslau, 1845); *Uebersetzung der Bibel* (1857); and *Das Judenthum und seine Geschichte* (3 vols., 1865-'71; English translation of part i., New York, 1866).

GEIJER, **Eric Gustaf**, a Swedish historian and poet, born at Ransäter, Wermland, Jan. 12, 1783, died in Upsal, April 23, 1847. At the age of 16 he was sent to the university of Upsal. He neglected to take his degree at the proper time, and consequently in 1803 was refused a tutorship in a distinguished family. This aroused his pride, and to restore his reputation he at once determined to contend for the next prize of the Swedish academy for excellence in composition. With very meagre authorities, and with scarcely paper enough for his manuscript, he wrote a eulogy upon the Swedish administrator Sten Sture, which obtained the first prize. He graduated master of arts in 1806, and after a short visit to England was appointed in 1810 lecturer on history at Upsal, and was a second time crowned by the academy for an essay on the question: "What advantages may be derived from the imagination in the moral education of man?" In 1811 he was one of twelve young men who founded the Gothic society, the object of which was to nurture a national spirit and national manners, and to derive the materials of literature, not from classical and foreign sources, but from the ancient traditions of the North. The new school was quickly divided into two parties, the Gothic and more moderate party, of which Geijer and Tegnér were the chiefs, and whose organ was the *Iduna*, and the Phosphorist party, so called from its organ the *Phosphoros*, of which Atterbom was the chief. In the *Iduna*, which appeared from 1811 to 1824, Geijer published his finest poems, as "The Viking," "The Last Scald," and "The Last Champion," which became immediately popular. His song of "The Charcoal Boy" is still a favorite throughout Sweden. In 1814-'15 he united with Afzelius in preparing a collection of Swedish popular ballads, and in 1817 was appointed professor of history at Upsal. He composed melodies for many of his own songs, and in 1824 published, in connection with Lindblad, *Musik för Sång och Pianoforte*. Liberal in politics and religion, he was twice offered a bishopric, which he declined, and twice represented the university of Upsal in the diet. His chief distinction is as the historian of Sweden. He was appointed with Fant

and Schröder to edit the collection of *Scriptores Rerum Suecicarum Medii Aevi* (2 vols., Stockholm, 1818-'25). His *Svea Rikes Häfder* ("Annals of Sweden," Upsal, 1825; translated into German, 1826) is a collection of dissertations on the early history and antiquities of the kingdom. His principal work is the *Svenska Folkets Historia* ("History of the Swedish People," 8 vols., Örebro, 1832-'6; translated into German by Leffler, Hamburg, 1832-'6; into French by Lundblad, Paris, 1840; and into English by Turner, London, 1845), which extends only to the death of Queen Christina, but has been continued by Carlson. The work of Fryxell is also regarded as a supplement to it. At once a history of ideas, of manners, and of institutions, it is remarkable both for eloquence and learning, for its patriotic tone. Among his minor works are a "Sketch of the State of Sweden from Charles XII. to Gustavus III." (Upsal, 1839), and "Life of Charles XIV. John" (1844). A complete edition has been published (12 vols., Stockholm, 1849-'55).

GEIKIE, Archibald. See supplement.

GEIKIE, Cunningham. See supplement.

GELA, an ancient city of southern Sicily, on a river of the same name (now Fiume di Terranova), founded about 690 B. C. by a colony of Rhodians from Lindus and Cretans. It soon became flourishing, and was the parent of Agrigentum (now Girgenti), which afterward surpassed the mother city. The constitution of Gela was originally oligarchical, but was overthrown in 505 B. C. by Cleander, who was the first of its tyrants. His brother Hippocrates succeeded him, and extended its influence and power over the greater part of Sicily. His successor Gelon's transfer of the seat of his power and of a part of the inhabitants of Gela to Syracuse (485), his brother Hiero being made governor of the former, caused its decay; and its desolation was completed about 280 by Phintias, tyrant of Agrigentum, who removed its inhabitants to a new town, to which he gave his name. In the time of Augustus it was already in ruins, which are still visible in the vicinity of Terranova.

GELATINE, an azotized substance obtained from various parts of the animal body, such as the white fibrous tissue, the skin and serous membranes, and cartilage, by boiling in water. The substance as it exists in the body is probably not precisely the same as that obtained by boiling, although it cannot be said with certainty that the proportions of its chemical constituents have been changed. No precise formula of equivalents has been established, and it is therefore usual to write the composition of gelatine in percentage parts by weight. According to Mulder it consists, in 100 parts, of carbon 50.40, hydrogen 6.64, nitrogen 18.84, and oxygen and sulphur 24.62, of which about 0.7, according to Verdeil, is sulphur; but the presence of sulphur is disputed, and gelatine, although an azotized, is not a proteine substance. Frémy and Scherer make the percentage of

nitrogen rather less than that here given. The gelatine of commerce is prepared as follows: The skins of calves' heads and other thick pieces which are unfit for the manufacture of leather are first freed from hair and thoroughly cleaned of flesh and fat, and well washed. They are then reduced by cutting machinery to small pieces or to a pulp, cold water being allowed to run through the pieces during this operation in order to remove all impurities. The pieces of skin or pulp are differently treated by different manufacturers in order to obtain the solution most readily, some employing the mechanical force of rollers in conjunction with the application of a temperature varying from 280° to 250° F. When the solution is obtained it is clarified with some albuminous matter, as the white of eggs or ox blood, and after settling is drawn off upon shallow coolers, as plates of glass or slates. When partially dry, so that it can be cut into convenient shapes for handling, it is removed upon nets or placed in a vacuum drying apparatus to complete the process of desiccation. In the course of the preparation the substance is flavored with essences. Bones and ivory also are made to yield gelatine by subjecting them, when crushed, to water boiling at high temperatures in a digester, or to the action of steam gradually raised to the pressure of 82 pounds to the square inch, and thus kept for 3½ hours. By this means their soluble portions are taken up, and the earthy matters, about 60 per cent. of the whole weight, are left behind, together with a soapy substance produced from the fat and lime of the bones. This residue is used for the manufacture of bone black, or the preparation of phosphorus, and is besides an excellent material for composts. The manufacture of gelatine has been largely carried on in France by first removing the earthy salts from bones by digesting them for many days in dilute hydrochloric acid, and afterward in boiling water.—For a long time gelatine was largely employed in the hospitals and pauper establishments of Paris, as a cheap and, as it was believed, very nutritive material for soups. Its value for this purpose was at last questioned, and the commission appointed to investigate its qualities reported unfavorably. It is, however, generally regarded as possessing nutritive properties, though in a less degree than fibrine and albumen; and even if insufficient itself to support life, its almost universal use in some form of food attests its importance as an article of diet. It also finds numerous other uses, as for the clarifying of liquors, in the manufacture of cements, as a chemical test for tannin, and in pharmacy for coating pills and forming pouches or capsules in which disagreeable medicines may be concealed and swallowed without disgust. It is also applied in the dressing of silk and other stuffs. It is made by the French into thin transparent sheets called *papier glacé*, which are used for copying drawings; and they also

prepare from it artificial flowers richly colored to imitate the natural specimens, or presenting the appearance, in their glittering and semi-transparent substance, of flowers wet with dew or drenched with rain. Another application of gelatine is for taking casts or forming moulds of objects presenting complicated forms, for retaining which plaster is not sufficiently adhesive. A series of casts in imitation of ivory were produced in this substance in 1844 by M. Franchi, for which the prize of the London society of arts was awarded in 1846. He afterward obtained gelatine casts from moulds of the same substance, the lines being perfectly retained in their original sharpness. He also took casts in gelatine from flat models, which he applied to cylindrical bodies, thus saving much expense in the carving or construction of intricate models.—Pure gelatine is colorless, transparent, inodorous, and insipid. It should be tested for smell by putting it in boiling water, as when dry the odor of glue may not be perceived. It softens and swells in cold water, but does not dissolve till heat is applied, a property which distinguishes it from fibrine and albumen. According to Bostock, one part of gelatine dissolved in 100 of water gelatinizes on cooling, but in 150 parts it remains liquid. When the solution is repeatedly warmed and cooled, especially if boiled, it loses its tendency to gelatinize, and becomes more and more soluble in cold water. Gelatine is soluble in all the dilute acids except tannic, in which respect it differs much from albumen. It is precipitated from aqueous solutions by excess of alcohol. Tannic acid is a very delicate test; when added to a solution of one part of gelatine in 5,000 parts of water, it will render it cloudy; when added to a strong solution, a dense curdy precipitate falls, which is the same substance as the basis of leather. Gelatine is rendered insoluble when mixed with chromic acid and exposed to the action of light. This property is applied in the manufacture of imitations of ivory, and in the reproduction of photographic prints, according to the invention of Woodbury and Albert.—Gelatine which is obtained from the sounds of fishes is called isinglass, and an impure variety is known as glue. (See GLUE, and ISINGLASS.)

GELDERLAND, or *Guelderland*, a province of Holland, bounded N. W. by the Zuyder Zee, S. E. by Prussia, and on the other sides by the provinces of Overijssel, Utrecht, South Holland, and North Brabant; area, 1,964 sq. m.; pop. in 1870, 432,698. Its surface is more hilly than that of most of the Netherlands; its climate is mild, but its soil, except in the river valleys, is poor. The principal streams are the Maas (separating it from North Brabant), Waal, Rhine, and Yssel, on the banks of which fruit, grain, hops, potatoes, and tobacco are cultivated with considerable success, while the more sterile districts have recently been planted with timber, or are used for cattle raising. Brewing, distilling, and the manufacture of paper, linen, tiles,

and leather, are important branches of industry, and there is also an extensive transit trade. There are iron mines in the canton of Zutphen. The herring fishery is actively prosecuted on the Zuyder Zee. Arnhem, the capital, Nimeguen, Zutphen, and Harderwyk are the chief towns.—Gelderland was made a county in 1079 by the emperor Henry IV., and a duchy in 1339 by Louis the Bavarian. It was governed by dukes of its own, who resided at its present capital, till 1528, when it passed into the hands of Charles V. It joined the union of Utrecht in 1579. In 1794 it was taken by the French, who held it till 1814, when it became a part of the Netherlands. A portion of upper Gelderland (area, about 450 sq. m.), including its capital Geldern, was added to Prussia by the peace of Utrecht (1713), and now forms part of the circle of Geldern in the district of Düsseldorf.

GELDERN, a town of Prussia, in the province of the Rhine, on the Niers, 28 m. N. W. of Düsseldorf; pop. in 1871, 5,096. It has a Catholic and a Protestant church, two convents, manufactures of cloth, stockings, hats, woollen, silk, and linen goods, and a considerable trade in grain. The town was built in 1097, and was till 1848 the residence of the counts and dukes of Geldern. (See **GELDERLAND**.) Its fortifications were razed by Frederick the Great in 1764.

GELL, Sir William, an English scholar, born at Hopton, Derbyshire, in 1777, died in Naples, Feb. 4, 1836. He graduated at Cambridge in 1798, and was sent on a secret mission to the Ionian Islands. In 1814 he accompanied the princess of Wales abroad as one of her chamberlains, and was one of the witnesses at her trial, after she had become queen. He subsequently returned to Italy, where he sojourned till his death. He was a voluminous writer on classical antiquities. His principal works are: "The Topography of Troy and its Vicinity" (fol., 1804); "Itinerary of Greece, with a Commentary on Pausanias and Strabo" (4to, 1810); and "Pompeiana, or Observations upon the Topography, Edifices, and Ornaments of Pompeii" (with J. P. Gandy, 8vo, 1817-'19; 8d ed., 1852). Of the last, a continuation in 2 vols. 8vo was published in 1832.

GELLERT, Christian Friedrich, a German poet and moralist, born in Hainichen, Saxony, July 4, 1715, died in Leipzig, Dec. 18, 1769. He was one of the early promoters of the great literary movement which produced Schiller and Goethe. The latter in his youth was one of his disciples, but judged his ethical system to be of an effeminate tendency. He published fables and poetical tales, which are still popular, letters, sacred hymns and odes, and a romance entitled "The Swedish Countess." He was professor of philosophy in the university of Leipzig.

GELLIUS, Aulus, a Roman grammarian, who flourished about the middle of the 2d century A. D., supposed to have been born in Rome. He studied rhetoric there, and philosophy at

Athens. He was still a youth when he commenced, during the long winter evenings spent at a country house near Athens, a compilation of extracts from Greek and Roman authors, concerning languages, antiquity, philosophy, history, and literature, interspersed with original remarks. He continued it at Rome, where he held a judicial office. His work, named from its origin *Noctes Atticae* ("Attic Nights"), and divided into 20 books (of which the 8th is lost), though without any attempt at order or arrangement, contains a mass of materials, valuable mostly as remnants of lost ancient authors. The *editio princeps* was published at Rome (1469); the best of the older editions at Leyden (1706), by Gronovius, reprinted at Leipsic (1762). The best of all is that of Hertz (Leipsic, 1858). An English translation was published by Bedloe (London, 1795).

GELON, a ruler of Syracuse, born in Gela in Sicily, died about 478 B. C. He served as commander of the cavalry under Hippocrates, tyrant of Gela; on whose death, the people revolting against his sons, Gelon supported the latter, but finally set them aside and assumed the chief power himself (491). Called to the assistance of the Gamori, the landed aristocracy of Syracuse, then expelled by the revolted slaves and the popular party, he contrived to become master of that city (about 485), appointed his brother Hiero governor of Gela, and by degrees extended his influence and power over all Sicily. He won the affections of the Syracusans by mildness, by the protection of arts and sciences, and by the aggrandizement of the city, for which purpose he even destroyed Camarina and other towns, and transplanted their inhabitants thither, as well as half the population of Gela. When Xerxes was threatening the invasion of Greece, the Lacedaemonians and Athenians invoked the assistance of Gelon. According to Herodotus, he offered to furnish 200 triremes, nearly 80,000 soldiers, and corn for the whole Grecian army so long as the war should last, provided he was made commander-in-chief. The condition being rejected, Gelon sent an ambassador to Delphi, with rich gifts, and orders to greet and acknowledge Xerxes if victorious. Herodotus, however, also mentions that the Syracusans give a different version of the affair, which vindicates the character of Gelon and the policy of the Syracusans in not assisting Greece. They were fully occupied at home, for the Carthaginians at this juncture invaded Sicily with a great army. Gelon completely defeated them at Himera (480), on the same day, according to Herodotus, on which the Greeks won the victory of Salamis, but according to Diodorus, on the day of the battle of Thermopylae. He now proposed to resign his power and restore popular liberty, but the offer was rejected in the assembly, and his exhibition of magnanimity was rewarded by the title of king, which he accepted and bore till his death. The Syracusans erected, against his

will, a splendid tomb to his memory, and honored him as a hero. When Timoleon, 130 years afterward, sought to destroy all vestiges of the tyrants, the statue of Gelon was excepted. His brother Hiero was his successor.

GEM (Lat. *gemma*, a bud), the designation of precious stones prized for their brilliant lustre and splendid colors or perfect limpidity. They possess also a hardness which renders them susceptible of the highest polish, and capable of retaining unimpaired the forms into which they are cut and the lines or figures that may be engraved upon them. These properties, in connection with their rarity, have given to them the highest value of all substances. The principal gems are diamonds, rubies, and emeralds; the finest specimens of these are noticed under their respective titles. Other beautiful species of gems are the agate, chrysoberyl, chrysolite, garnet, sapphire, topaz, tourmaline, &c. These stones are not usually presented by nature in their full beauty; but they are found in the form of worn pebbles among the sands derived from the disintegration of the rocks in which they were originally contained. Some, however, are obtained crystallized in the matrix of quartz, calcareous spar, or other gangue of veins in which they were produced, or in geodes, of the dark cavities of which they made with other crystals a lining or incrustation. The crystals may have the perfections of the stone fully developed, but art is not satisfied with the form, and this is almost always sacrificed to fit the stone to the shapes judged best suited to display its highest lustre. The rough pebble requires the work of the lapidary to develop its beauties. The processes to which the stones are subjected are described in the articles **DIAMOND** and **LAPIDARY**; the method of carving them to bring out from their differently colored layers figures in relief is described under **CAMEO**; and gem engraving will be treated in this article.—To distinguish gems from each other and from their artificial counterfeits, a practised eye was formerly sufficient; but modern imitations are so perfect, that the tests of comparative hardness and of specific gravity are often required. The chemical tests which are usually employed to distinguish minerals cannot be applied to these stones on account of the injury they would occasion. The finest collection of gems in the world is that of the emperor of Russia. Siberia has proved a rich field for their production, and all precious stones found there belong to the crown. They are taken to Yekaterinburg, and being cut and polished in the government works, the choicest are selected for the imperial treasury. Clarke in his account of his travels in Russia makes frequent reference to the abundance of fine gems met with in the cabinets and jewellers' shops, and states that in Moscow they were so much more highly prized than in western Europe, that the most costly gems were sometimes purchased in London to be deposited in Russian collections. Different Asiatic coun-

tries, particularly Hindostan, Pegu, and Ceylon, have been famous from the remotest periods for their rich gems; and in modern times Brazil, Peru, and south Africa have rivalled them in these productions.—GEM ENGRAVING, known also as the glyptic art (Gr. γλυπτειν, to engrave), was skilfully practised in very remote times. In Exodus xxviii. 17–20, the following stones are designated as those upon which were engraved the names of the 12 children of Israel: sardius, topaz, carbuncle, emerald, sapphire, diamond, ligure, agate, amethyst, beryl, onyx, and jasper. At this early period, as we learn from verse 11 of the same chapter, engraving of signets, and upon the hardest stones, was practised. The Israelites, it is believed, acquired the art from the Egyptians, who are known to have made use of the lapidary's wheel and emery powder, and are supposed to have been acquainted with the diamond and the method of engraving other hard stones by means of it. The Assyrians and Babylonians were very skilful in engraving on gems, many of which have been found in the ruins of their cities. Many of their seals are most delicately and minutely ornamented with various sacred devices and with the forms of animals. The Greeks adopted the art, and practised it with the greatest zeal and success. Their works of the time of Alexander the Great are still the most perfect specimens. The most distinguished among their earlier artists was Pyrgoteles, who alone was permitted to engrave the head of Alexander, as Apelles only was allowed to paint his portrait, and Lysippus to cast his image in bronze. During the reign of Augustus in Rome, Dioscurides from Æolia in Asia Minor attained the highest eminence. His head of Io is regarded by some as the finest engraved gem in existence, and others almost equally beautiful are two busts of Augustus, a head of Demosthenes on an amethyst, and various mythological representations. Several of the most skilful artists of Greece established themselves at Rome under the emperors. With the empire the art declined, and though the mechanical execution was not lost, no productions of genius appeared till the 15th century. At this time it became fashionable to make collections of antique gems, and among others Lorenzo de' Medici was especially interested in this object and in encouraging artists to imitate the finest productions, in which they attained great success. The same taste soon spread to France, Germany, and England; and in all civilized countries the art has since been held in high estimation. As applied to the hardest gems, as the diamond, ruby, sapphire, and topaz, it is no doubt carried to a higher degree of perfection than was attained in ancient times, for among the antique engraved gems preserved there are few if any of this class. Engraved gems are for the most part readily referred by connoisseurs to their true period, country, and sometimes to the artist himself. Each had his own cipher, which is

commonly found upon the gem, though this is in modern times imitated, together with the peculiar style of the ancient artists and their complete work, in great perfection. Specimens of Egyptian art are recognized by the representations of the peculiar favorite animals and divinities of this people, accompanied with their hieroglyphics. Their gems were engraved almost exclusively in intaglio, and they were of the form designated as *scarabæi*, from the upper surface of the stone, always of the oval form, being cut to represent the beetle. The Etruscans also adopted this form, but their devices more resemble those of the earliest Greek workmanship. Their specimens are distinguished by low relief, a granular border surrounding the engraving, stiffness in the figures, peculiar style of letters and writing, wings given to the deities which the Greeks represent without wings, and names generally attached to the figures. The Greeks also practised chiefly in intaglio, and some of their finest works are in chalcedony and carnelian. The highly famed Dionysiac bull of Hyllus, an artist supposed to have lived before the age of Augustus, is upon chalcedony; and a celebrated specimen in carnelian is the beautiful seal which once belonged to Michel Angelo, and was afterward preserved in the national library at Paris. The engraving represents a vintage, but the design has been referred in various learned dissertations to a number of different objects, some of mythological character. Many impressions and copies have been taken of this famous specimen. The engraved gems of the first 15 centuries A. D., excepting the imitations of antique works, generally have designs from Scriptural subjects—images of Christ and of the Virgin Mary, representations of the Good Shepherd, and often a fish, symbolical of the Saviour, from the letters in its Greek name, ἰχθῆς, being the initial letters in the appellation Ἰησοῦς Χριστὸς Θεοῦ Υἱὸς Σωτῆρ. Some terms employed to designate certain styles of antique gems may be properly noticed here before speaking of the art in modern times. Stones convex on one side are said to be *en cabochon*; *chimæra* are those with representations of imaginary beings made up of portions taken from different animals; *grylli* are those with hideous heads, said to be so called from an Athenian named Gryllus, who was extraordinarily ugly; *conjugata*, or joined, are those with heads represented together upon the same profile, called opposite when they face each other. Engraving was practised both in intaglio and in rilievo, and the two styles were sometimes combined in the same specimen. Stones having differently colored layers, like the onyx, were especially adapted for the rilievo style, for an account of which see *CAMEO*.—In modern times the finest gem engravers are found among the Italian artists of the 18th century, and chiefly those of Florence. Some of their works are hardly inferior to those of the most famous Grecian artists. Flaviano Sirletti of Florence, who died in 1737, was especially distinguished

for his copies of ancient gems and exact imitations of the ancient letters. The Costanzis and many others also attained great repute; and in the present century are some whose productions, as those particularly of Signor Rega of Naples, rank with the famous antique gems. Among the Germans, Daniel Engelhard of Nuremberg, a friend of Albert Dürer, was celebrated for his skill in engraving crests and arms. He died in 1552. The works of the Pichlers, father and son, who came from Tyrol, are of the highest merit, especially those of the father. The son was much in Italy, and is often spoken of as an Italian. The celebrated Poniatowski collection of antique gems has recently been credited to the elder Pichler. Natter of Swabia, who died in 1763, was not only a workman of the most delicate skill and refined taste, but a student and author also, and published in 1754 a treatise specially devoted to his art: *Traité de la méthode antique de graver en pierres fines comparée avec la méthode moderne*. From this work it appears that the ancients employed the same sort of tools and the same methods as those in use at the present day. The modern practice is described by Holtzapffel in vol. iii. of his "Mechanical Manipulation."—The apparatus employed in engraving consists of a foot lathe attached to a small table, upon which is fixed a little pillar for holding the horizontal pulley, which is the receptacle for the cutting tool. This part of the apparatus is called the mill. The tools are soft iron wire spindles carefully annealed and nicely fitted to the hollow axis of the pulley. Only one is used at a time. When set in its place it projects through the bearings of the pulley, one end extending horizontally on the right-hand side of the operator, who sits at his work in front of the table. This extremity of each tool is fashioned for its special work. Most of them terminate in a small disk, the edge of which, as it rotates rapidly, cuts lines in the stone held up against it, the tool being fed with diamond dust and oil. The larger sized disks are only about a quarter of an inch in diameter, and from this they are made of decreasing sizes down to $\frac{1}{16}$ of an inch, when the disk can scarcely be distinguished by the eye from the stem. They are also variously shaped for special kinds of cutting. The stone intended to be engraved is usually shaped by the lapidary, and is sometimes set by the jeweller before it is engraved. If not set, the engraver secures it to a wooden handle by the cement known as the lapidary's; or if set, he secures it in a notch in a piece of cork. The polish is removed by roughening the face with a suitable cutting powder, as the tools work better upon a rough surface, and the outline of the design, which is next marked with a brass point, is the more conspicuous. The area thus enclosed is then sunk by the tools to a suitable depth; and within this the details of the design are successively introduced and excavated. For the parallel lines, called color lines, a thicker disk with two cutting edges is

employed, its form being that of a little pulley; the two edges are just as far apart as the lines they are intended to cut, and as one pair is cut the stone is moved so as to bring the outer edge of the disk into the groove marked by the other edge, and thus the work goes on step by step over the surface to be thus "colored." The plan must be perfectly understood by the artist at the commencement of his work, and as it goes on he watches the effect produced with the aid of a magnifying glass conveniently attached to a stand over the tool, and occasionally takes a proof of his work in wax. After the stone is engraved the polish is restored to the flat surface by a pewter polishing disk or lapped with rotten stone and water. The engraved portions are polished with great care, first by using in the mill copper tools charged with diamond powder; this buries itself more deeply in the copper than in the iron tools, and a smoother surface is thus obtained. Boxwood tools charged with still finer diamond powder are next used, and after these copper tools charged with rotten stone and water. The harder gems, excepting the diamond, which is engraved with the greatest difficulty, are better adapted for this process than those of softer quality. The latter are liable to hold the diamond powder and cause it to wear out the tools; they do not when finished present such smooth and highly polished surfaces as the harder stones. The amethyst is considered as soft a stone as can be cut very smoothly. Carnelian and bloodstone are of close texture, and admit of excellent work; the ruby cuts slowly, but small pieces are apt to flake off. The sapphire is firm and close; it cuts slowly, but presents beautifully smooth surfaces.—ARTIFICIAL GEMS. The great value attached to precious stones led at an early period to successful attempts to imitate them. The Egyptians possessed the art of coloring glass, and among their mixtures they produced excellent imitations of the most beautiful gems, so that, as Pliny states, it was difficult to distinguish the false from the real. Their artificial emeralds, sapphires, and hyacinths are spoken of by various ancient authors. Some of the first named were of such gigantic size that they were used in the construction of statues, as of that of Serapis in the Egyptian labyrinth, 18½ ft. in height. Another presented by the king of Babylon to an Egyptian Pharaoh was 6 ft. long and 4½ broad; and an obelisk in the temple of Jupiter 60 ft. high and 6 ft. broad was composed of four artificial emeralds. These were very extraordinary productions if made only of pieces of colored glass. Seneca also makes mention of one in his time who manufactured artificial emeralds. Beckmann states that in some ancient collections at Rome are pieces of colored glass, which were once used as jewels. In the Museum Victorium are seen a chrysolite and emerald of faultless execution. In the 17th century the discovery of the preparation of gold and bin-oxide of tin, called purple of Cassius, afforded

the means of giving a ruby-red color to glass, and artificial rubies were then first made, especially by one John Kunkel, afterward Löwenstiern, inspector in 1679 of the glass houses in Potadam. In modern times the art has been wonderfully perfected by the French, chiefly through the genius of M. Donault-Wieland. A glass called strass, of great lustre and perfectly transparent, of which the ingredients are given in the article GLASS, is prepared as the basis of the composition. It resembles the diamond in high refractive power as in its other qualities, except hardness. That it may be free from color its ingredients must be absolutely pure; and care must be exercised in selecting crucibles least likely to impart color to the fused mixture. Artificial diamonds are made from pure strass, which is cut directly into brilliants and roses, without the addition of other matter. Other gems are imitated by melting and mixing it with substances having a metallic base, generally oxides, which communicate the various colors.—The researches and experiments of M. Ebelmen are of a higher order of art. He conceived the idea in 1847 of forming various mixtures with some ingredients volatile at very high heat. By the dispersion of these in the furnace the other ingredients should crystallize, as substances held in solution in liquids crystallize when these are evaporated. He thus proposed to produce the ruby, corundum or sapphire, and other precious stones. The volatile solvents or fluxes he employed were principally boracic acid and borax. The spinelle ruby, among the first minerals he imitated, was obtained by mixing together 30 parts of magnesia, 25 of alumina, 1 of chlorate of potash, and 35 of boracic acid, and subjecting 500 grammes (7,716 grains) of the compound to high temperature in the muffle of a furnace for eight days. The crystals measured 0.197 inch on a side. Chrysoberyl was produced in crystals with faces of 0.24 inch, perfectly transparent, and scratching topaz from a mixture of alumina 12 grammes, glucine 8.5, carbonate of lime 10, and fused boracic acid 14 grammes. The object of the lime was to form a fusible borate for holding the other ingredients in a condition favorable for crystallization. Chrysolite in well defined crystals resulted from silica 4.5, magnesia 6.15, and boracic acid 6. Transparent crystals of pure alumina, which are sapphire or corundum, and which presented the same hardness and specific gravity with this mineral, were a product of alumina thus fused with 8 or 4 parts of borax, or of 10 parts of alumina with 4 of silica and 16 of borax. M. Ebelmen employed also as fluxes the salts of phosphorus and the carbonates of potash and of soda, all which are volatile at high temperatures, and by means of these solvents reproduced many other minerals, as he announced to the academy in 1851. His death shortly after terminated his interesting researches; but they have been successfully continued by Deville,

Elsner, Manross, and others, and numerous artificial minerals have been prepared.—The great establishment of M. Bourguignon in Paris was at one time the most famous manufactory of artificial gems in the world. About 100 workmen, besides many women and girls, were constantly employed in preparing and fusing the mixtures, cutting and polishing the stones, and lining the imitation pearls with fish scales and wax. The sand used to furnish the silica is from the forest of Fontainebleau; and its quality is so highly esteemed that much is exported for similar use elsewhere. The gems are such perfect imitations that they can be distinguished from genuine stones only by the closest scrutiny of those experienced in such matters. The great hardness of the natural stones it is found most difficult to imitate, and there is a want of permanency in the qualities of most of the imitations, which at last causes their true character to appear.—See "A Popular Treatise on Gems," by Dr. L. Feuchtwanger (New York, 1859; revised ed., 1867); "The Natural History of Gems," by C. W. King (London, 1867); "Diamonds and Precious Stones," by Harry Emanuel (London, 1867); and "Diamonds and Precious Stones," translated from the French of Louis Dieulafoy by F. Sanford (New York, 1874).

GEMINI (the twins), the third constellation in the zodiac, so named from its two brightest stars, to which the names Castor and Pollux are given, and which are about midway between Aldebaran and Regulus.

GEMISTUS, George, surnamed **PLETHO**, a scholar and philosopher of the 15th century, born in Constantinople, and said to have lived to the age of 100. He held a high position at the court of the Palæologi, and at the council of Florence in 1439 opposed the union of the churches of the East and the West. Subsequently banished from his country, he found an asylum in Italy, and declared himself in favor of the Latins. While the philosophy of Aristotle was still reigning, he became an enthusiastic votary of the Platonic theories in metaphysics and natural theology, and being admitted to the circle of the Medici, prompted Cosmo to found his celebrated Platonic academy. His treatise in praise of Platonism inaugurated the long quarrel between the disciples of the two great masters of antiquity, which produced a profound study of their systems. Gemistus, however, mingled with the Platonic philosophy the notions of the later Alexandrian school and of the spurious writings attributed to Zoroaster and Hermes, and revived in the West that eclecticism, half Christian and half pagan, half oriental and half Greek, which flourished during the decline of the Greek philosophy at Alexandria.

GEMÜNDER, George, an American violin maker, born at Ingelfingen, Würtemberg, April 13, 1816. He was a pupil of Baptiste Vuillaume in Paris, and removed to the United States in 1847, establishing himself in Boston,

Mass. In 1851 his violins obtained the prize medal of the world's fair in London. In 1852 he removed to New York, where he has since lived. Vuillaume and other makers of violins in Europe adopted the practice of giving a pseudo-antiquity to their wood by a chemical process, in order to gain for their instruments a desirable quality of tone; but wood thus treated soon loses its resonance, and after a time the instruments become worthless. Gemünder, rejecting this method, has succeeded with natural wood in producing violins which fulfil every requirement, and in respect of volume, power, equality, and quickness of tone, are fully equal to the work of the best old masters. In the model and finish of his instruments, and especially in the varnish, he is exceedingly successful. He reproduces faithfully the distinctive characteristics of the old Italian violins, so that his instruments are often taken for genuine productions of Cremona. One called the Kaiser violin, finished in 1873 and exhibited in the great exposition at Vienna, was pronounced an Italian violin of the classic period, because it was believed impossible to produce so fine a tone in a new instrument.

GENDRIN, Auguste Nicolas, a French physician, born at Châteaudun, Dec. 6, 1796. He received a doctor's diploma in 1821, and published on this occasion *Du traitement de la blennorrhagie*, relating to his new method of injecting opium. His *Recherches sur la nature et sur les causes prochaines des fièvres* (2 vols., 1823), and his *Histoire anatomique des inflammations* (2 vols., 1826), which latter has been translated into German, won academical prizes, as did some of his subsequent writings, the most renowned being his *Traité philosophique de médecine pratique* (3 vols., 1838-'41). After having been attached to various hospitals, he was from 1836 to 1866 the principal physician of La Pitié. During the June insurrection of 1832 he incurred odium for having, as alleged, reported to the authorities political offenders on whom he had happened to attend professionally; and his *Mémoire médico-légal*, showing that the prince of Condé did not die by his own hands in 1830, but by those of assassins, also gave rise to unfavorable comments, which he endeavored in vain to combat.

GENDRON, Auguste, a French painter, born in Paris in 1818. He studied under Delaroche and in Italy, and became famous (1844-'6) by his picture representing *Les willis*, or maidens resuscitated from their graves according to a Bohemian legend, and dancing during a whole night. His "Dante commented upon by Boccaccio" (1844), his "Sylphs" (1852), "Titania" (1853), and many other works, have since been exhibited. He excels in historical, fantastic, and fairy delineations, and has also painted on porcelain for the manufactory at Sèvres, and remarkable decorations for the palais d'Orsay.

GENELLI, Bonaventura, a German painter, born in Berlin about 1798, died in Weimar,

Nov. 18, 1868. He studied under his father, who was a landscape painter, and at the academy in Berlin, and during ten years in Italy, chiefly in Rome. He was subsequently employed in classical decorations at Leipsic till 1836, when he removed to Munich. In 1859 he was invited to Weimar by the grand duke, and spent there the rest of his life. His most famous works are "Lot's Entry into Zoar," and aquarels illustrating *Æsop*, *Homer*, *Apollo*, *Sappho*, *Dante*, the life of a witch, and the life of a rake. His later works are chiefly oil paintings relating to mythological and classical subjects, upon which he brought to bear a glowing imagination and great ideality. The publication of some of his later paintings was begun in 1870 in a work entitled *Satura*.—His brother **HANS CHRISTIAN**, born in Berlin, Dec. 8, 1823, has published several works relating to the fine arts, and excels as a draughtsman and architect. His son **CAMILLO**, who died in 1867, gave promise of being a good painter; and his daughter **GABRIELE** is a popular actress.

GENESEE, a river of western New York, rises in Potter co., Pa., within a few yards of the head waters of the Alleghany and the north branch of the Susquehanna, flows N. W. and N. E. through Alleghany, Wyoming, Livingston, and Monroe counties, N. Y., and falls into Lake Ontario 7 m. N. of Rochester. Its length is about 145 m. It is navigable from Lake Ontario to the N. line of Rochester. The mouth, protected by two fine piers, forms a good harbor, which gives rise to the village of Charlotte, on the W. side. The river abounds in beautiful scenery, especially in cataracts. In Livingston co., near Portage, are three falls within a distance of two miles, which are respectively 60, 90, and 110 ft. high; and for several miles below these the stream flows between perpendicular banks 400 ft. high. At the S. line of Rochester commences a series of rapids, which terminate in the centre of the city in a sheer fall of 96 ft., called Genesee falls. This was the scene of Sam Patch's last leap. Six miles from the mouth of the river is a broken fall of 84 ft., by which the stream reaches the level of the lake. The Genesee is tapped above the rapids to feed the Erie canal, which at Rochester crosses it by a fine limestone aqueduct of nine arches, each of 50 ft. span. The Genesee Valley canal, commencing at Rochester, follows the course of the river for a considerable distance, locks into it at Mt. Morris, and crosses it at Portage by an aqueduct. The Buffalo branch of the Erie railway has a trestle bridge near the same place, 800 ft. long and 234 ft. high.

GENESEE. I. A W. county of New York, drained by Tonawanda creek; area, about 486 sq. m.; pop. in 1870, 21,562. The surface is almost level, and the soil, consisting chiefly of a very sandy loam, is well suited both to grain and pasturage. Salt springs exist in several places, and iron, limestone, and water cement are obtained. The county is traversed by the

New York Central railroad, the Batavia and Attica branch, the Canandaigua, Batavia, and Tonawanda branch, and the Erie railway. The chief productions in 1870 were 722,874 bushels of wheat, 428,710 of Indian corn, 509,690 of oats, 380,466 of barley, 21,447 of buckwheat, 275,717 of potatoes, 42,891 of peas and beans, 888,721 lbs. of butter, 461,337 of wool, 143,208 of hops, and 60,144 tons of hay. There were 10,411 horses, 10,485 milch cows, 7,796 other cattle, 78,884 sheep, and 8,496 swine; 5 manufactories of agricultural implements, 3 of brooms, 30 of carriages and wagons, 3 of cheese, 9 of clothing, 18 of barrels and casks, 1 of malt, 14 of saddlery and harness, 8 of tin, copper, and sheet-iron ware, 13 flour mills, 1 planing mill, 9 saw mills, 4 tanneries, and 8 currying establishments. Capital, Batavia. IL. A S. E. county of the S. peninsula of Michigan, drained by Flint and Shiawassee rivers; area, 500 sq. m.; pop. in 1870, 38,900. It is intersected by the Flint and Père Marquette, the Detroit and Milwaukee, and the Port Huron and Lake Michigan railroads. Its surface is undulating, covered with extensive oak openings in the S. part, and densely wooded with pine and other timber in the N. The chief productions in 1870 were 553,183 bushels of wheat, 826,687 of Indian corn, 410,561 of oats, 288,829 of potatoes, 910,876 lbs. of butter, 375,877 of wool, and 48,041 tons of hay. There were 7,466 horses, 8,850 milch cows, 11,860 other cattle, 79,306 sheep, and 9,818 swine; 12 manufactories of agricultural implements, 4 of boots and shoes, 8 of bricks, 31 of carriages, 9 of barrels and casks, 18 of furniture, 12 of iron castings, 18 of saddlery and harness, 8 of sashes, doors, and blinds, 11 of tin, copper, and sheet iron, 8 of woollen goods, 16 flour mills, 5 breweries, 3 planing mills, and 50 saw mills. Capital, Flint.

GENESIS, the name of the first book in the Bible, denoting in Greek "the generation," i. e., the account of the generation or production of all things. In Hebrew Bibles it is called *Bereshith*, signifying "in the beginning," because it commences with that word. By some Jewish writers it is also called *Sepher yetzirah*, the book of creation. Its history goes back to the very earliest ages of the human race, and covers a period of upward of 2,800 years; giving an account of the creation, the fall of man, the religion, arts, settlements, genealogies, corruption, and destruction of the antediluvian world; of the re-peopling and division of the earth, the dispersion of its inhabitants, the calling of Abraham, and the rise and progress of the Hebrew nation, to the death of Joseph.—For all questions relating to the authorship and authenticity of the book, see **PENTATEUCH**.

GENET (in this country commonly written **GENET**), **Edmond Charles**, a French diplomatist, born in Versailles, Jan. 8, 1765, died at Schodack, Rensselaer co., N. Y., July 14, 1834. Although his father was attached to the court and his

sister, Mme. Campan, was in the service of Marie Antoinette, he made himself known by his republican opinions. In April, 1789, he was appointed chargé d'affaires to the court of St. Petersburg, where his situation soon became uncomfortable; in 1791 he was informed by Count Ostermann, minister of Catharine II. that he would better not appear again at the court; and in July, 1792, he was formally dismissed. On his return to France he was appointed ambassador to Holland; but before going thither he received (December, 1792) his nomination as minister to the United States. He arrived in April, 1793, at Charleston, S. C., where he was cordially welcomed. On May 20 he had a triumphant reception in Philadelphia; the citizens presented him with an address congratulating France upon obtaining the freedom she had helped the United States to secure. Encouraged by these demonstrations of popular feeling, Genet thought he could easily persuade the American people to embark in the cause of France, notwithstanding the proclamation of neutrality recently issued by President Washington. He openly maintained that the United States were in duty bound to side with France against England, and bitterly denounced the American government for want of sympathy toward the French republic. He even fitted out privateers from Charleston, to cruise against the vessels of nations then at peace with the United States, and to project hostile expeditions against Florida and Louisiana, then colonies of Spain. In consequence of these imprudent measures Washington demanded and obtained his recall. Genet decided not to return to France, settled in the state of New York, was naturalized, and married a daughter of George Clinton.

GENET (*genetta*, Cuv.), a digitigrade carnivorous mammal of the family *viverridae*, inhabiting Africa, and occasionally found in southern

(Common Genet (*Genetta vulgaris*).

Europe. The dentition and structural characters are the same as in the civet, the principal difference being that the anal pouch which contains the glands secreting the odorous substance is much less developed and prominent in the genet than in the civet. The common

genet of Barbary (*viverra genetta*, Linn.; *G. vulgaris*, Cuv.) is ashy gray, with blackish spots; the tail is nearly as long as the body, with long hair and 10 or 11 dark and light rings; the length of the body is about a foot and the tail about the same, and the height 5

stores. One of the Episcopal churches is a fine stone structure in Gothic style, and was built at an expense of \$40,000. Steamers ply daily on the lake, which is open throughout the year, between Geneva and Watkins, at the opposite extremity, touching at intermediate places. There are six hotels, two national banks, gas works, marble works, two iron works, bending works, a flour mill, a malt house, &c. The nursery business is the chief branch of industry, employing 18 firms and many individuals. The nurseries cover over 8,000 acres, and furnish occupation to from 600 to 700 men and boys. The value of the stock is about \$1,800,000, and the annual shipments of trees, &c., amount to over \$500,000. Hobart Free college (called Geneva college till 1852) was established here in 1824, under the direction of Episcopalians, and in 1872 had 9 professors, 44 students, a library of 18,000 volumes, and a well appointed observatory. The union public school, a fine brick building costing \$80,000, and its four branches, have about 1,200 pupils. A Roman Catholic school is in process of erection. There are two private schools for girls and one for boys, two weekly newspapers, and eight churches.

Pale Genet (*Genetta Senegalensis*).

in. It is only semi-carnivorous, and will live in captivity wholly on vegetable food. The claws are sharp, semi-retractile, and well adapted for climbing; the anal secretion has a musky odor; as in other nocturnal animals, the pupil is vertical. The habits of the genet are like those of the weasel tribe; it is easily tamed, and is sometimes employed to catch rats and mice in houses; the period of gestation in captivity is about four months. The pale genet (*G. Senegalensis*, Fischer), or fossane, resembles the former species, and is reddish gray with pale spots above the eyes, brown bands and spots on the body and limbs, and an obscurely ringed tail. Both species prey upon small mammals, birds, and reptiles, and are not averse to fruits. Several other species are described.

GENEVA, a S. E. county of Alabama, bordering on Florida and intersected by the Choctawhatchee and Pea rivers; area, about 550 sq. m.; pop. in 1870, 2,957, of whom 227 were colored. Pine forests abound; the soil is sandy and poor. The chief productions in 1870 were 58,642 bushels of Indian corn, 4,990 of oats, 22,039 of sweet potatoes, 4,749 of peas and beans, 420 bales of cotton, and 40,657 lbs. of rice. There were 2,148 milch cows, 5,125 other cattle, 4,222 sheep, 8,874 swine, and 408 horses. Capital, Geneva.

GENEVA, a village of Ontario co., New York, beautifully situated at the N. W. extremity of Seneca lake, on the New York Central and the Geneva and Ithaca railroads, 100 m. E. of Buffalo; pop. in 1870, 5,521. The principal street runs parallel with the bank of the lake, at an elevation of 100 ft., and from many of the residences terraced gardens extend to the shore. It commands a fine view of the lake and of the surrounding country. Geneva is handsomely built, and contains many large

GENEVA (Fr. *Genève*; Ger. *Genf*; Ital. *Ginevra*). I. A canton of Switzerland, bounded N. by Vaud and the lake of Geneva, and on all other sides by France; area, 109 sq. m.; pop. in 1870, 93,289, of whom 47,868 were Catholics, 48,689 Protestants, 771 Christians of other denominations, and 961 Jews and other non-Christians; 20,209 families were French, 978 German, 121 Italian, and 7 Romaic. The peasantry speak a patois which resembles somewhat that spoken in the neighboring districts of France and Vaud. The canton is without mountains, and its highest hills rise only about 500 ft. above the lake. The soil is hilly and stony, and therefore not fertile; but in consequence of the excellent cultivation, the canton resembles a garden. The Rhône, which flows southwesterly from the lake of Geneva, receives the Arve, Nante de Vernier, Avril, London, and Laire. The canton is divided into three districts and contains 48 communes; in 81 of them the Catholics are a majority, and in 17 the Protestants. The canton has 5 gymnasias or secondary schools and about 75 primary schools with 5,600 pupils. The receipts and expenditures are about 3,000,000 francs annually, the public debt about 16,000,000 francs. The legislature, called the grand council, consists of one representative for every 666 inhabitants. Geneva was the first Swiss state to introduce trial by jury (1844), and exerted a liberal influence upon the national councils in the promulgation of the federal constitution in 1848. The canton sends four delegates to the lower house of the Swiss diet, and furnishes a contingent to the army of about 4,000 men. The Protestant churches are governed by a consistory, which is elected for four years, appoints an executive committee of 5, and is

composed of 25 lay members and 6 clergymen. The *compagnie des pasteurs*, which comprises all clergymen and professors of theology, presides over the religious instruction of the Protestant population, and controls ecclesiastical appointments. The Catholics of the canton, who are divided into 23 parishes, formerly belonged to the diocese of Lausanne. In 1872 the pope erected it into a diocese, a measure which the government of the canton denounced as contrary to the law, insisting that a new diocese could be erected only with the consent of the government. The free "Evangelical Church," which is unconnected with the state, has a theological school in the city of Geneva, and had in 1872 eight clergymen. The administration of education is in the hands of the government, but the parishes are called upon to contribute toward its support. II. A city,

capital of the canton, at the W. extremity of the lake of Geneva, where the Rhône issues from it, and 3 m. above the confluence of the Arve; pop. in 1870, 46,774, of whom 25,897 were Protestants, 20,284 Catholics, 519 members of other Christian denominations, and 574 Jews and other non-Christians. Including the suburbs, the population in 1870 was 57,697. The old city, on the left bank of the Rhône, is hilly and narrow. It was enlarged in 1850 by the conversion of the fortifications into promenades and quays. On the right bank is the more modern part, where the streets are mostly straight and wide. The two parts are connected by six bridges. The Mont Blanc bridge, near the lake, is magnificent. The cathedral, dedicated to St. Peter, erected in the beginning of the 12th century, in the Byzantine style, is believed to occupy the site of an ancient tem-

Geneva.

ple of Apollo. The hôtel de ville formerly had a number of inclined planes without steps, enabling the aged senators to ride up to the highest story in their litters or even on horseback. The public library contains about 60,000 volumes and 600 MSS. The Musée Rath is named after its founder and devoted to the fine arts. On a small island of the Rhône, below the Mont Blanc bridge, stands a monument to Rousseau, who was born in Geneva in 1712. Of the churches in Geneva, the Reformed have seven, the Catholics three; there are also one English and one Greek church, and a synagogue. In 1873 all the Catholic churches passed into the hands of the Old Catholics, as they alone took part in the election of pastors ordered by the new church law of the canton. Geneva has celebrated private schools, which

attract many pupils from abroad, and commercial, industrial, artistic, and musical schools. The university of Geneva was founded in 1368, and was reorganized by Calvin and Beza. The college attached to it resembles the English Eton and Westminster schools, and is conducted by masters (*regentes*), under the direction of a rector, a principal, and the professors of the university. The studies at the university embrace belles-lettres, philosophy and science, divinity, and law. The environs of Geneva are dotted with villas. The suburb Plainpalaïs is regularly built, and has about 8,000 inhabitants. Les Eaux Vives, a suburb on the road to Chamouni, has a population of about 8,000. In the vicinity is a celebrated lunatic asylum in a magnificent edifice.—Geneva has long been celebrated for its manufacture of

watches, jewelry, and musical boxes, employing about 3,000 persons, who make more than 100,000 watches a year, and work up annually about 75,000 ounces of gold, 5,000 marks of silver, and \$200,000 worth of precious stones. There are also manufactories of velvet, silk goods, India stuffs, hats, leather, cutlery, firearms, chronometers, and mathematical, musical, and surgical instruments. Geneva became a free port in 1854. The transit trade is considerable, and the neighborhood of France and Italy gives rise to active smuggling. The forwarding, commission, and banking business, especially the latter, are of great magnitude. Geneva is also the principal telegraph station and the focus of the railways of Switzerland, and the central point of the federal postal and customs union.—Calvin lived in Geneva, and Servetus was burned at the stake in the *champ du bourreau*, the ancient place of execution, outside the walls. John Knox was made a citizen of Geneva in 1558. Among the distinguished persons born in the city are Jean Jacques Rousseau, Necker, the naturalists De Saussure, Deluc, Bonnet, Huber, and De Candolle; Dumont, the friend of Mirabeau and of Jeremy Bentham; Sismondi the historian; and Albert Gallatin, the American statesman. Sir Humphry Davy died and was buried in Geneva. Guizot the French statesman, whose mother found an asylum in Geneva, received his early education there.—Geneva is supposed to have formed part of the territory of the Allobroges. It was subjected to the Romans about 122 B. C. The city was burned during the reign of Heliogabalus, and rebuilt by Aurelian, who gave it many privileges and called it Aurelianum Allobrogum. In the 5th century it was annexed to the possessions of the Burgundians, and in the 6th to the Frankish kingdom. The republic of Geneva originated in the municipal institutions of the town, to which Charlemagne granted certain privileges, subordinate to the bishop, who was called prince of Geneva, and was an immediate feudatory of the German empire. Dissensions occurred on many occasions between the citizens and the bishops on one side, and the counts of Genevois, who ruled the adjoining province of Savoy and claimed jurisdiction over Geneva, on the other. After the extinction of the line of the counts of Genevois, the dukes of Savoy were appointed their successors by the German emperor Sigismund (1422). Hence the claim of Savoy upon Geneva, from which the Genevans could only free themselves after several centuries by alliances with other Swiss states, and by the aid of the reformation. The bishop of Geneva was expelled in 1534. Through the zeal of William Farel, the new service of the reformed religion was established in August, 1535. But the old parties, the partisans of Savoy and the national party, reappeared under new forms and fomented discord. Farel prevailed upon Calvin, who came to Geneva in August, 1536, to remain there, and eventu-

ally made himself the temporal as well as spiritual ruler of the town. Geneva became the leader of religion and the model of morals in Europe, the home of literature and learning, and the metropolis of Calvinism. An attack of Charles Emanuel of Savoy upon Geneva (December, 1602) was gallantly repelled, and the victory then achieved is still commemorated. The independence of Geneva was solemnly recognized by the house of Savoy in 1754. The government of the city fell into the hands of patrician families, as everywhere else in Switzerland, and the history of this century becomes a list of fierce and often bloody struggles to regain the old rights and privileges belonging to the people. In 1782 the administration party obtained the interference of France, Sardinia, and Bern, who sent troops into Geneva and oppressed the democrats. In consequence, about 1,000 Genevese applied for permission to settle in Ireland, and the Irish parliament voted £50,000 to defray the expense of their journey, and gave them lands near Waterford; but they soon abandoned the settlement. Other fugitives stirred up the French republicans to unite Geneva to France, and in 1798 the town was occupied by French troops and incorporated with France as a part of the department of Léman. After the overthrow of Napoleon it joined the renewed Swiss confederacy (March 20, 1815), and several places which had formerly belonged to France and Savoy were added to its territory. A new and more liberal constitution was adopted in May, 1847. The Geneva convention of 1864 brought about an agreement among the European powers to consider the edifices and members of medical departments strictly neutral in time of war. In 1868 naval wars were specially included in this treaty. The United States, however, did not join in it. In December, 1871, the court of arbitration on the Alabama question, consisting of five members appointed by the governments of the United States, Great Britain, Italy, Switzerland, and Brazil, met here. The deposed duke of Brunswick died in Geneva, Aug. 19, 1873, and left to the city his entire fortune, about 100,000,000 francs.

GENEVA, Lake of, or Lake Lemman (anc. *Lacus Lemanus*), the largest lake of Switzerland, extending in the form of a crescent, with its horns toward the south, between France, on the south, and the cantons of Geneva, Vaud, and Valais. Its N. bank forms an arc about 58 m. long, exclusive of the sinuosities; along its S. shore it measures 46 m.; and its breadth varies from 8 or 9 m. in the middle to 4 m. near the E. and 1 m. at the W. extremity; area, about 240 sq. m. Its greatest depth, which is on a line between Evian and Ouchy, is about 1,000 ft.; its average depth is 400 ft. Its elevation above the sea is about 1,230 ft., but in summer, when the Alpine snows melt, it sometimes rises 6 or 8 ft. higher. At other periods it presents in particular parts of the lake, most commonly near Geneva, the

curious phenomenon of a rise and fall of from 2 to 5 ft. in the course of 25 minutes. These changes of level, called *seiches*, have never been fully accounted for, but are supposed to be owing to the unequal pressure of the atmosphere upon different parts of the surface. They are independent of the wind, and most frequent when the clouds are low and heavy. The lake is never frozen over, though ice forms in winter near its lower extremity. Its waters are pure and bright blue, like those of the Mediterranean. The Rhône enters it at the E. end and a dark muddy stream, and leaves it near Geneva perfectly pellucid and of the finest azure hue. The débris brought down by this stream are deposited around the upper end, and have made considerable encroachments upon its basin. Port Valais, $1\frac{1}{2}$ m. inland, was formerly situated on the shore, and the waters are said to have extended as far as Bex, 12 m. up the Rhône. About 40 small streams discharge themselves into this lake. It has fewer fish than other Swiss lakes, but contains excellent trout, pike, carp, and perch, and a kind of salmon. Steamers ply daily between Geneva at the W. and Villeneuve at the E. end. The scenery is an unfailing theme of admiration to travellers. On the north are beautiful vine-covered hills dotted with villages; opposite, the abrupt cliffs of the Chablais rise 5,000 ft. above the lake. The majestic Alps are seen beyond them through the openings. On the east, between the lofty summits of the Dent de Morcles and the Dent du Midi, about 9,000 ft. high, a narrow pass opens into Valais, while at the W. end the lake narrows almost to a point, and terminates among the pleasant slopes on which stand the city and suburbs of Geneva. The lake is famous in literary history as the scene of the *Nouvelle Héloïse*, and for the abode in its vicinity of many celebrated authors.

GENEVIÈVE. I. The patron saint of Paris, born in Nanterre about 422, died in Paris in 512. According to the most common tradition, her parents, Severus and Gerontia, were very poor, and Geneviève's early occupation was tending flocks. On the summit of Mont Valérien is a field which still bears her name, as well as a spring and grotto at its foot. In her 15th year she was dedicated to the divine service by St. Germanus of Auxerre. She predicted in 449 the invasion of the Huns under Attila, and when in 451 he threatened to attack Paris, her prayers were believed to have saved that city. Again, during the protracted siege of Paris by the Franks under Clovis, she animated the courage of the citizens, and contrived to introduce into the city a supply of provisions. When Paris fell, Geneviève's intercession saved the vanquished from harsh measures. She was revered by Clovis, and was buried near him in the church of Sts. Peter and Paul, which he had built, and which together with the adjoining abbey bore her name. Her shrine, said to be the work of St. Eloi, was replaced in the 18th century by one much larger and richer,

which was long considered the palladium of Paris. It was sent to the mint in 1791, and the relics it contained were burned. A monumental church, begun by the architect Soufflot in 1757, was named the Pantheon in 1791, and restored to public worship in 1852, under the title of St. Geneviève. The stone sarcophagus which formerly contained her remains has been transferred to the church St. Étienne-du-Mont. The life of St. Geneviève, written by her contemporary Genesius, was restored to its original simplicity by the Bollandists, and republished in 1648 in the *Acta Sanctorum*. Her feast is celebrated on Jan. 8. II. A daughter of the duke of Brabant, born about 680. Hagiographers and historians have spoken of Geneviève de Brabant sometimes as a canonized saint, sometimes as only beatified; the Bollandists say her feast was kept in April; but she was never acknowledged as a saint by Rome. Her history, the subject of so much romance and poetry, may thus be condensed from the best sources. She was married about 700 to Sigfrid, count palatine of Ostendick in the territory of Treves. He was summoned to attend Charles Martel on his expedition against the Saracens, leaving his wife and estates to the guardianship of one of his knights named Golo. The lady, whose pregnancy was not known to her husband, had now to resist the criminal solicitations of Golo, who after the birth of her boy accused her of adultery, and obtained from Sigfrid an order to put mother and child to death. Instead of executing this order, Golo abandoned them in a forest, where they subsisted for several years, until they were discovered by Sigfrid during a hunt, and carried back in triumph to his castle of Hohen-Simmern. Geneviève, in thanksgiving for her preservation, had a chapel built on the spot which had sheltered her babe and herself. The ruins of this chapel, called Frauenkirchen, are still visible, and contain, together with the despoiled tombs of Geneviève and Sigfrid, an altar on which are rudely sculptured the main facts of their history.

GENGHIS (or *Zingis*) **KHAN**, an Asiatic conqueror, born about 1160, died in August, 1227. His father was the chief of a horde, consisting of numerous families or clans, and tributary to the khan of eastern Tartary. When born, the child had his hand full of blood; and, pleased by the interpretation of this sign as a prediction of conquest and glory, the father procured for Genghis, or, as he was then called, Temudjin, an able teacher, who soon developed in him a talent for government and war. Temudjin was only in his 14th year when he succeeded his father, and after some reverses he made himself master of the neighboring tribes, 70 of whose chiefs are said to have been thrown into kettles of boiling water at his command. Against a league of more numerous tribes he was also victorious, but was unable to subdue them, and compelled to invoke the protection of Vang or Ung, the great khan of

the Keraite Tartars. Temudjin supported him in his turn in different wars, and received the daughter of the khan in marriage. But his bravery, liberality, and success soon made him an object of envy and fear; a war ensued, in which the khan lost his army on the battle field, and his life while in flight. Another enemy of Temudjin, Tayan, khan of the Naiman Tartars, met with a similar fate in and after the battle of Altai, which gave Temudjin a great part of Mongolia and the capital Karakorum. In the next spring he held a great assembly of his nation at Blun-Yulad, his capital, where the representatives of all the hordes appeared and proclaimed him their great khan. Then, obeying the words of a *shaman* (inspired man), who promised him the conquest of the earth, he adopted the title of Genghis (greatest), and gave to his people that of Mongols (the bold). He organized their civil and military system, and laid down a code of laws which is still known in Asia under his name, and is based upon the belief in one God and the monarchy of one great khan, to be elected from the reigning family by the *kuraltai*, or assembly of the nation. It grants great privileges to the nobles, allows polygamy, forbids to conclude peace except with the vanquished, and commands the delivery of arms into the hands of the government in times of peace, and when no national hunts are held. He granted equal rights to every religion, and admitted men of talents or merit to his court, whatever their creed. Appreciating the wisdom of other nations, he caused many celebrated books to be translated from foreign languages. Ambition soon prompted him to new expeditions. The annexation of the Uigur or central Tartars served to complete the conquest of Tartary; he now commenced that of China, passed the great wall, vanquished the opposing armies, plundered and destroyed 96 cities, reduced to ashes smaller towns and villages, and carried away multitudes of children, who were destroyed in the homeward march, besides a vast spoil of cattle, gold, silver, and silk. In a second expedition he was equally successful. He devastated the country, and in 1215 took Yehking (now Peking) by assault. This great city was pillaged and burned. Giving the command in the east to his son Tutshee, Genghis now turned his sword to the west, crushed some revolted tribes and their allies, and took a bloody revenge for the murder of his ambassadors on Mohammed, sultan of Kharesmia. A vast army, and the cities of Bokhara, Samarcand, and others, opposed him in vain. The Mongols conquered and devastated the whole country; the cities were destroyed, and with them immense treasures of eastern science and art; and numberless inhabitants were slaughtered or carried away as slaves. Another Mongol army marched against Kaptchak, and took Derbend on the shore of the Caspian sea; another reduced Iran and Astrakhan, and, after a bloody battle on the Kalka, south-

ern Russia; another continued the conquest of China and subdued Corea. The countries N. W. of India were also conquered, and an expedition against that country was begun. In this he is said to have shared the fate of Alexander the Great in a similar undertaking; after some victories, the army refused to advance further, and he was compelled to return amid terrible difficulties. He then turned his arms against the kingdom of Tangut, passed the desert of Gobi in winter, and defeated 800,000 men on a frozen lake; the Tangut dynasty was extirpated. He was meditating new conquests when death ended his career. He was buried in his native home, and his funeral was celebrated with songs, and some historians say with a hecatomb of beautiful young girls. His empire was divided among his four sons, Oglutai, chosen great khan, Jagatai, Tulni, and Tutshee, whose armies soon completed the conquest of China, overthrew the caliph of Bagdad, made the sultan of Iconium tributary, and penetrated as far as the Oder and the Danube.

GENII. See MYTHOLOGY.

GENLIS, *Félicité Stéphanie Ducrest de Saint-Aubin*, countess de, a French authoress, born near Autun, Jan. 25, 1746, died in Paris, Dec. 31, 1830. She had a taste for music, acquired great proficiency on the harp, and played seven other instruments; but her education was almost entirely neglected. When scarcely 15 years of age she was married to Count Brûlart de Genlis, a friend of her father who had fallen in love with her on seeing her portrait. Full of ambition, she then devoted herself with great zeal to study. By the influence of her aunt, Mme. de Montesson, who was subsequently secretly married to the duke of Orleans, she was in 1770 appointed a lady in waiting in the household of his daughter-in-law the duchess de Chartres, became soon afterward governess of the daughter of that princess, and was formally nominated in 1782 by the duke de Chartres (afterward duke of Orleans) "governor" of his three sons, the eldest of whom was afterward King Louis Philippe. Such a title given to a woman gave rise to no little scandal, and the influence she subsequently exercised upon the political course of her employer, the notorious Philippe Egalité, seemed to warrant the most injurious suspicions. During her governorship she published several works devoted to the moral education of her pupils—the *Théâtre d'éducation*, *Annales de la vertu*, *Adèle et Théodore*, *Les écailles du château*—which were generally well received by the public, and were highly praised by Gailard, La Harpe, and other eminent critics. During the first years of the revolution she proclaimed her liberal opinions, and is said to have been the principal adviser of Philippe Egalité. She published *Conseils sur l'éducation du dauphin*, and *Leçons d'une gouvernante*, written in the spirit of the new constitution. She was, however, obliged to emigrate, and in

1793 retired for a while to Switzerland, and then to Altona. Amid all her troubles she neglected no opportunity of mingling in worldly pleasures. During this period she published several works, among which were her *Mères rivales*, *Les petits émigrés*, and *Le petit La Bruyère*. In 1800 she returned to France, and was well received by the first consul; she was allowed handsome apartments at the arsenal and a pension of 6,000 francs, to which the wife of Joseph on his accession to the throne of Naples added an annuity of 8,000. In return for this she had to write twice a month to Napoleon, and communicate to him her opinions and observations on politics and current events. It is not known what service she rendered to Joseph Bonaparte. This period of comparative repose and prosperity was also one of literary activity; she gave to the public, among other works, *Mlle. de Clermont*, the best of her performances, which ranks among standard novels in the French language, *La duchesse de La Vallière*, *Mme. de Maintenon*, and *Le siège de La Rochelle*. Her *Histoire de Henri le Grand* displeased Napoleon, and she lost her pension and residence. At the return of the Bourbons the Orleans family contented themselves with paying a small pension to their old "governor." Her temper meanwhile, which never had been very gentle, became sullen and unmanageable; her misanthropy increased with years. Her wrath was especially directed against the philosophers of the last century; she published amended editions, with critical notes, of several works of Rousseau and Voltaire, and even contemplated a similar "emendation" of the *Encyclopédie*, but, appalled at the magnitude of the undertaking, gave it up, and turned her pen against the most popular contemporary authors. Mme. de Staël, Byron, Sir Walter Scott, and Lamartine were among the objects of her attacks. She was 60 years old when she published her historical novel *Jeune de France*, and over 80 when she completed her personal *Mémoires*, in 10 large 8vo vols.

GENNESARET, or *Genesareth*, Lake of, called also the sea of Chinnereth (Heb. *Yam Kinnereth*), the sea of Galilee, the sea of Tiberias, and by the Arabs Bahr Tubariyeh, situated in Palestine, 65 m. N. of the Dead sea. The lake is pear-shaped; the greatest width is 8½ m. from Mejdol (Magdala) to Kheraa (Gergesa); the extreme length is 15 m. The Jordan, flowing

through it from north to south, connects it with the Dead sea. The water of the lake is clear and sweet, except near the salt springs and where it is defiled by the drainage of Tiberias. In the basin of the lake are a number of warm springs, which are said to have in-

Lake of Genesareth.

creased in volume and temperature after the earthquake of 1837, which laid Tiberias in ruins. The lake does not appear to be of volcanic origin, but simply part of the great Jordan depression. The surrounding hills are of a uniform brown color, and are limestone, capped in places with basalt; they are recessed from the shore, or rise very gradually from it, and not very high. Its level, which varies at different times of the year, is between 600 and 700 ft. below that of the Mediterranean. There is little variety or beauty in its natural features, and the interest connected with it springs from its associations, especially from the fact that much of the public life of Christ was spent on its shores. The lake abounded with the choicest kinds of fish, as it does now, and the southern portion especially was a noted fishing ground. Populous cities and villages then flourished around it, as Tiberias, Magdala, Capernaum, Chorazin, the two Bethsaldas, Gama-la, and Hippos, almost all of which are now uninhabited ruins.

GENOA (Ital. *Genova*; Fr. *Gênes*; anc. *Genoa*). L. A. N. W. province of the kingdom of Italy, bordering on the provinces of Porto Maurizio, Coni, Alessandria, Pavia, Piacenza, Parma, and Massa Carrara, and the gulf of Genoa; area, 1,588 sq. m.; pop. in 1872, 716,284. The province is divided into the districts of Albenga, Chiavari, Genoa, Levante, and Savona. It forms a narrow coast land, called Riviera di Levante and Riviera di Ponente, around the gulf of Genoa, and embraces the former duchy of Genoa. The rivers, mostly springing from the Apennines, have but a short

course through this province, either emptying into the gulf or passing over to the adjacent provinces. Agriculture is unimportant, for want of level land, but the hills are covered with vines and olives, and furnish delicate fruits which are largely exported; bee-keeping is a lucrative industry of the mountaineers. There are silver, copper, lead, manganese, and coal mines; and the slate quarried near Lavagna is celebrated for its deep, lustrous black color. The Ligurian Apennines touch the Ligurian Alps near the sources of the Bormida, where the road from Millesimo to Savona climbs three mountain ridges from 1,500 to 2,800 ft. high. From here the Ligurian Apennines extend along the coast of the gulf in three distinct chains, separated by deep depressions: the Monte S. Giorgio, N. W. of Savona; Ermetta and Reisa, N. W. of Voltri; Penello, Orditano, and Secco, N. W. of Genoa.

North of this city are the Monte della Bochetta, 2,432 ft. high, and the Colli dei Giovi, 1,447 ft., with a double pass that permitted the construction of a turnpike and a railway to Alessandria. East of these the Apennines rise much higher. N. E. of Genoa is Monte Antola, 4,151 ft. high. N. E. of Chiavari, near the boundary, is Monte Penna, 5,860 ft. high. From Genoa to Antivari, and from Lavagna to Spezia and Porto Venere, close to the coast, are mountain chains 2,000 to 8,000 ft. high. The mountainous peninsulas, Portofino and Castellana, form S. E. of Genoa the gulfs of Rapallo and Spezia, of which the latter is important as a safe and commodious port for the Italian fleet. A railway skirts the entire coast of both Rivieras, and runs parallel with the magnificent highway called the Cornice road. The line penetrates numerous promontories by more than 80 cuttings and tunnels, many of

Palazzo Doria.

them of considerable length, in a distance of 24 m., between Genoa and Chiavari. Another railway through the province, connecting Genoa with Alessandria, has nine tunnels between Arquata and the capital. The last tunnel before reaching Genoa, called the Galleria dei Giovi, is more than 2 m. long. II. A city, the capital of the province, on the N. extremity of the gulf of the same name; lat. 44° 24' N., lon. 8° 54' E.; pop. in 1872, 130,289. It is surrounded by a double wall, the smaller encircling the inner city, by ramparts and extensive outworks, detached forts, and redoubts, which make it one of the best fortified cities of Europe. Its large semicircular harbor is defended by two converging moles, the eastern or old, and the western or new. In the height of her power the city was called Genova la Superba (the proud); and the designation has also been used in the sense of "mag-

nificent," on account of her beautiful situation and numerous marble palaces. On the N. E. side is the royal war harbor (*darsena reale*), with the marine arsenal. On the E. side is the free harbor (*porto franco*). This is a little walled town of itself, containing more than 800 large storehouses, and no priest, soldier, or woman is allowed to enter it except by special permission. A high wall with arcades separates the harbor from the houses, most of them six stories high, of the via Carlo Alberto and the piazza di Scaricamento. The quay is connected by rail with the railway station. Viewed from the harbor, the city, rising like an amphitheatre, with its churches, palaces, promenades, and gardens, with its encircling fortifications, and with the bare summits of the Apennines and the ice-covered peaks of the Alps behind, offers one of the grandest and most picturesque sights in the world. The

streets are mostly narrow, irregular, and steep, paved with smooth slabs of lava, with a pathway of bricks in the centre for mules; but the vie Balbi, Nuova, and Nuovissima are broad and straight; and the more modern vie Carlo Felice, Carlo Alberto, Carretierra, and Giulia compare favorably with the chief thoroughfares of other commercial cities. The splendid architecture of the palaces, the external frescoes of the houses, the imposing religious processions, and the varied attire of the passengers, the ancient attractions of the city, are all gradually disappearing. The *pezzotto*, the long white veil with which the women formerly covered head and shoulders, is now rarely seen except on Sunday when they go to mass. The palaces were once renowned for their artistic riches, but the collections are constantly diminishing, and have become very small. The most striking of the palaces is the palazzo Doria, in a conspicuous position overlooking the sea. It was constructed in 1529 by the renowned Doria, prince of Melfi; it is now almost abandoned, and retains but few traces of its former beauty. The ducal palace, restored in 1778 after designs by Simone Carlone, was formerly full of objects of art, which have been removed, some of them to the municipal palace, formerly the palazzo Doria Turpi. In the anteroom of the hall of the town council are a bust and autograph letters of Columbus. The Carlo Felice is one of the largest and finest theatres in the kingdom. That of Sant' Agostino is built entirely of wood, and can accommodate 2,000 spectators. A new café, with a garden and fountains, is one of the most splendid establishments of the kind in Europe. The *dogana*, or custom house, is the ancient edifice of the bank of St. George, and has in the hall two ranges of statues, larger than life, of the Dorias, Fieschi, Grimaldis, and other renowned personages of the old republic. Among the numerous churches, that of Santa Maria di Carignano is prominent for architectural beauty. The cathedral, dedicated to San Lorenzo, presents a strange mixture of styles. It was built in the 11th century, and has been restored many times. The richest part is the chapel of St. John the Baptist, into which no woman can enter except on one day in the year, in recollection of the daughter of Herodias. In it is preserved the *sacro catino*, affirmed to be one of the gifts of the queen of Sheba to Solomon, and the vessel from which Christ ate the paschal lamb. It was a part of the spoil taken at Cæsarea in 1101. It was long supposed to be cut from a single emerald, but is now known to be glass. In the piazza di Acqua, a public promenade, stands a statue of Columbus on a circular pedestal with protruding prows of galleys; at the feet of the statue kneels the figure of America. Genoa has a university with an observatory and a library of 50,000 volumes, a naval school, a lyceum, technical schools, seminaries, normal schools, and many societies for the promotion of arts and sciences.

The foundling hospitals, orphan asylums, hospitals for the sick, crippled, insane, and deaf, and poorhouses, are in a praiseworthy condition. About two miles from the city is the *campo santo* (cemetery), with a magnificent circular chapel and many artistic monuments and vaults. The most delightful excursion in the environs is to the villa Pallavicini at Pegli, where the park extends to a considerable height on the slopes of the coast, affording charming views of Genoa, the sea, and the mountains. Luxuriant vegetation, kiosks in Pompeian, Turkish, and Chinese styles, a mausoleum, the remains of an ancient Roman burial place, and a stalactite grotto heighten the interest of the place.—The railway to Alessandria brings to Genoa a large trade with the provinces of northern Italy, Austria, Germany, and Switzerland. Cotton industry employs about 3,000 workmen, and about 9,000 are employed in the manufacture of silk goods. There are large establishments producing lace, embroideries, and filigree work. The hat factories export yearly about 100,000 hats to South America. Other considerable industries are the extraction of oil, the fabrication of soap, the preparation of chemicals, the making of artificial flowers, and the packing of candied fruit. The furniture factories employ several thousand workmen, and the construction of boats and ships is steadily increasing. In 1871 vessels of the aggregate tonnage of 50,000 were launched. Among them were two iron steamers, the first iron vessels built in Italy. Genoa is a free port. About 7,000 sailing vessels of 700,000 tons, and 3,000 steamers of 600,000 tons, enter every year. In 1871 the entries of vessels engaged in foreign trade were 3,009, with an aggregate tonnage of 934,263; the tonnage of coasting vessels entering in the same year was 406,265. The total imports amounted to \$51,500,000; exports, \$22,250,000. Numerous lines of steamers ply between Genoa and Leghorn, Civitá Vecchia, Spezia, Naples, Messina, Nice, Tunis, and other ports on the Mediterranean. The population of Genoa has increased but little during the past ten years, on account of the excessive octroi duties levied on almost everything that passes the gates. To escape these, many people have settled in the neighboring communes, and Sampierdarena and other villages have grown largely in consequence.—The history of Genoa may be traced in legendary traditions to a time preceding the foundation of Rome. Livy mentions it first, at the beginning of the second Punic war, as a town in friendly relations with the Romans. It was subdued and partly destroyed during that war by a Carthaginian fleet, which sailed from the Balearic isles under the command of Mago; the Romans rebuilt it, and it afterward became a Roman *municipium*. In the time of Strabo it was an emporium for the produce of the interior, exchanged by the Ligurians for the wine and oil of other parts of Italy. After the fall of the western empire it suffered greatly from the in-

vading Goths, was taken by the Lombards in the 7th century, and conquered from them in the 8th by Charlemagne, who appointed a count for the government of the coast of Liguria. After the dismemberment of the Frankish empire, it became independent, and shared the fate of the Lombard cities, participating in their bloody struggles during the long contest for the iron crown of Lombardy between the emperors of Germany, the Berengarii, and others. After having been pillaged in 936 by the Saracens, Genoa strengthened its navy, entered into an alliance with Pisa, and expelled the Mohammedans from the islands of Corsica, Capraja, and Sardinia (1016-'21), of the two former of which it kept possession. But the increasing maritime importance of the Genoese aroused the jealousy of their commercial neighbors, and they had to struggle for the maintenance of their power in the western part of the Mediterranean against the rival republic of Pisa, and in its eastern part against Venice. The hostilities with the former commenced in the year 1070. The services of the Genoese in the first crusade were rewarded with a strip of the coast of Palestine. After the second war with Pisa (1118-'32) they undertook an expedition against the Moors of Spain, with a large fleet carrying a land force of 12,000 men, conquered the island of Minorca (1146), Almeria (1147), where they found immense booty, and, in concert with the Catalonians, Tortosa (1148). Their power was also rapidly extended over the coast of the Mediterranean; before the close of the 12th century they were masters of Monaco, Nice, Montferat, Marseilles, and nearly the whole coast of Provence. The third struggle with Pisa commenced in 1162, and lasted for nearly a century. The early part of the fourth was marked by a great naval victory near Meloria (1284) of the Genoese over the Pisans, who lost 8,000 killed and 18,000 prisoners, most of whom were doomed by the cruelty of the victors to perish in chains; it was virtually ended by the conquest of Elba, and the destruction of the harbor of Pisa, under Corrado Doria (1290). Thus peace was conquered, and the power of the rival republic destroyed. No less severe had been the struggle with Venice since the conquest of Constantinople by the Franks (1204). Having assisted Michael Palæologus to reconquer the capital of the Byzantine empire (1261), the Genoese were rewarded with the suburbs of Pera and Galata, and the port of Smyrna, which made them masters of the Black sea. This brought them into collision with the Venetians, who disputed their supremacy in those seas; but after several naval battles a truce was concluded in 1271. On the termination of the wars with Pisa a powerful Genoese fleet crossed the Adriatic, and won a great victory near Curzola, where 84 Venetian galleys were taken or burned, and 7,000 captives made, among them the admiral Dandolo. This was followed by a treaty of peace (1299),

which surrendered the commerce of the Black sea to the exclusive dominion of the Genoese, whose flourishing colonies and factories defended by forts soon lined all its coasts. Kaffa, or Feodosia, in the Crimea, became one of the finest commercial cities of Europe. Favored by the friendship and indolence of the Byzantines, they carried on the commerce of the East, including India, through the Black and Caspian seas. A new war with Venice broke out in 1346, in which the Genoese were victorious in a sea fight in sight of Constantinople, but were beaten in another near the coast of Sardinia. To escape the consequence of this defeat and the perils of intestine commotions, they subjected themselves to the duke of Milan, Giovanni Visconti, whose yoke, however, they soon shook off. Having recommenced the war (1377), they took Chioggia, besieged Venice, and nearly reduced it, when two of its citizens, Vettor Pisani and Carlo Zeno, revived the spirit of the besieged, created a new fleet, blockaded Chioggia, and compelled the Genoese to surrender. The peace of Turin (1381) terminated the wars of the two greatest maritime republics of the middle ages; it was preserved with slight interruptions during the decline of both, caused particularly by the conquests of the Turks in the East and the maritime discoveries in the West. Giustiniani and his companions strove heroically, but in vain, to save the great bulwark of Christendom, Constantinople, and the interests of Genoa (1458); and Mohammed II. revenged himself by stripping the republic of all its possessions in the East; even the commercial access to the Euxine was soon closed by the Turks.—During all this growth and decline of the republic, its internal commotions, caused by the parties of the plebeians and patricians, and the subdivisions of the latter, had been a source of continual perils and distractions. Having been governed by consuls till 1190, then by podestàs (annual magistrates, who were chosen from foreign cities) till 1270, it fell under the usurpation of Oberto Spinola and Oberto Doria, the "captains of liberty," who reconciled the lower classes and maintained their power till 1291. A new change was the institution of a council consisting of 12 members, subsequently of 24, 12 nobles and 12 plebeians. The feuds and even fights of the democratic and aristocratic parties, the Guelphs and Ghibellines, were meanwhile continuous. The latter faction, whose chiefs were the Dorias and Spinolas, was at last overcome and exiled by their opponents, headed by the Fieschi and Grimaldis, but afterward found means of returning. These party struggles assumed the worst shape in the first half of the 14th century. To remedy these evils the dogate for life was instituted (1339), with the exclusion of the nobles of both parties. But neither this nor the addition of councils was sufficient to give peace to the distracted state; new contentions arose with new families; there were doges and anti-doges;

some were exiled, others forced upon the people. The Viscontis of Milan, and at a later period the kings of France, availed themselves of these dissensions to take possession of the republic. Francis I. held it during the first part of his wars with Charles V., but in 1528 the celebrated admiral Andrea Doria delivered the state from the French, and established a new constitution, which lasted to the end of the republic. The new form of government was strictly aristocratic; a roll of families, both plebeian and patrician, was formed, the nobility divided into the old and new; the former comprised the Grimaldis, Fieschi, Dorias, Spinolas, and 24 others distinguished by age, honors, or riches, and the latter 437 houses, to which new families could be added; the doge was elected for two years, and both branches of the nobility could aspire to this dignity. But the power of the state had long since departed; its conquests, colonies, and maritime stations were lost one after another; the last of them, Corsica, revolted in 1730, and was ceded to France in 1768; the commerce of the seas and of the East passed successively through the hands of the Portuguese, Spaniards, Dutch, and English; the flag of Genoa was insulted with impunity by the Mohammedan pirates of northern Africa, and its naval force was a mere shadow of the ancient fleets which awed all the shores of the Mediterranean and Black seas. The single bank of St. George (*compera di San Giorgio*), which had been founded in 1407, still maintained its importance as an institution for loans and deposits, to which even foreign states, and particularly Spain, were greatly indebted. When in 1796 the French had conquered the neighboring territories, Genoa strove in vain to sustain itself by neutrality. A rising of the democratic party was suppressed, after several days of bloodshed, by the nobles, who were assisted by the poorest of the population; but the French directory took the part of the democracy, and demanded a change in the constitution. This demand was supported by an army, and finally agreed to. The French garrison was taken into the city, and the state changed into the republic of Liguria, with a constitution like that of France, and some additional territory. In 1800 Genoa, under Masséna, sustained a siege by the Austrians and English, and was compelled to capitulate to the former, who were obliged, however, to give it up after the battle of Marengo. Bonaparte, as first consul, gave it a new and less democratic constitution, which was soon abolished on the establishment of the French empire. After the coronation of Napoleon at Milan, the last of the doges, Durazzo, repaired to that city, and expressed the desire of the people for the change; and the decree of June 4, 1805, merged the republic in the empire, to form the three new departments of Genoa, Montenotte, and the Apennines. The bank of St. George, whose credit had suffered greatly by repeated loans to the state,

was abolished, and the debts of the latter were transferred to the account of France. In 1814 Genoa was occupied by the English, with whose permission the ancient constitution was reestablished. But the congress of Vienna gave Genoa as a duchy to Sardinia. In 1821 it joined for a moment the revolutionary movements of Italy. At the end of March, 1849, after the defeat of Charles Albert at Novara, and the conclusion of a truce with the Austrians, a revolutionary outbreak took place, the national guards occupied the forts, and the garrison was compelled to withdraw. A provisional government, under Avezzana, Morchio, and Reta, was formed, and the independence of the republic was proclaimed. But a large body of Sardinian troops, under Gen. Lamarmora, soon appeared before Genoa; a bloody struggle ensued, and the forts and principal points of the city were taken by the royal soldiery. In the mean while a deputation was sent to Turin, which returned with the amnesty of the king, excluding, however, the chief leaders of the movement, who had withdrawn on board the United States steamer Princeton. On April 10 Genoa was disarmed, and the monarchical government restored. Garibaldi seized two steamships in the port of Genoa in May, 1860, and thence sailed for the liberation of Sicily. Early in 1861 the territory of Genoa was made a province of the kingdom of Italy.

GENOA, *Tommaso Alberto Vittore*, duke of, an Italian prince, born Feb. 6, 1854. He is the son of Victor Emanuel's late brother Ferdinand, and of a Saxon princess, the duchess of Genoa (privately remarried in 1856 to her former secretary, Marquis Rapallo). He was educated at Dr. Arnold's school in England, and was brought forward in 1870 as a candidate for the throne of Spain, but his name was withdrawn at the request of Victor Emanuel. He is an officer of the Italian navy, and visited China and Japan in 1873, and the United States in 1874.

GENOUE (originally *Genouin*), *Antoine Eugène de*, a French journalist and author, born in Montélimart in February, 1792, died in Hyères, April 19, 1849. He was the son of a cabaret keeper. He began his career as a political writer for the royalist journal *Le Conservateur*. In 1820 he founded the journal *Le Défenseur*, and in 1821 he bought the *Étoile*, which has since borne the name of *La Gazette de France*. He abandoned his intention of entering the priesthood when, in 1822, he was ennobled by Louis XVIII.; but in 1835, after the death of his wife, he took orders, and began to preach in Paris. The archbishop of Paris soon ordered him to quit either preaching or journalism, and he quit preaching. In 1846 he was elected by the city of Toulouse to the chamber of deputies, where he acted with the legitimist opposition. He differed, however, in many points from the legitimist party, defending universal suffrage, national representation, and legitimacy allied with popular sovereignty.

In February, 1848, at the outbreak of the revolution, he allied himself with the revolutionary party in order to attempt a restoration of the Bourbons by a general vote of the people. When he saw that his efforts were fruitless he retired from public life. The bold advocacy of his principles in the *Gazette de France* involved him in 63 lawsuits, which cost him more than 100,000 francs. He wrote *Leçons et modèles de littérature sacrée* (1837); *Histoire de France* (16 vols., 1844-'7); a new French translation of the Bible, with the Latin version, a translation of the works of the fathers of the first three centuries, of those of St. Clement of Alexandria, &c.

GENOVESI, Antonio, an Italian philosopher and political economist, born at Castiglione, near Salerno, Nov. 1, 1712, died in Naples, Sept. 22, 1769. He received priest's orders in Salerno in 1736, and held in succession the chair of rhetoric in the seminary of Salerno, and that of metaphysics in the university of Naples. He substituted the scientific doubt of Descartes and the Baconian laws of induction for the traditional belief in authority. He was threatened with persecution, but explained his views in a satisfactory manner, and was protected by Benedict XIV. In 1754 a chair of public economy was established in the university for Genovesi, by his friend Interi, a wealthy Florentine, who prescribed as one of the conditions of his endowment that no monk should ever be appointed professor. This chair was the first of the kind in Europe. On the expulsion of the Jesuits from Naples in 1767, he was requested by the government to propose a plan of university education. He advised the establishment of chairs of physical science and history, the substitution of mathematics for scholastic philosophy, and a chair for the interpretation of Cicero's *De Officiis*. His favorite masters in philosophy, after Bacon and Descartes, were Leibnitz, Locke, and Vico. As an economist Genovesi advocated the abolition of the usury laws and of convents and monasteries, inculcated the doctrines of free trade, and proclaimed before Adam Smith the supremacy of labor in the creation of the wealth of nations. As early as 1764 he predicted the emancipation of the American colonies, the foundation of the United States, and the total failure of the colonial system. He died as his friends were reading to him the *Phædo* of Plato. His works include *Elementa Metaphysices*; *Lezioni di commercio o di economia civile*; *Diocesina*, relating to the rights and duties of man; *Logica per giovanetti*; *Istituzioni delle scienze metafisiche*; *Meditazioni filosofiche*; *Elementi di fisica sperimentale*; *Lettere ad un amico provinciale*; and *Lettere accademiche sulla questione se sieno più felici gli ignoranti che gli scienziati*. His life has been written in Latin by Fabroni. G. M. Galanti, one of his best pupils, published in 1771 *Elogio storico dell' abate Genovesi*; and Racciopi's *Genovesi* appeared in 1871.

GENSERIC (from *Gaiseric*, prince of the spear), a Vandal conqueror, bastard brother and successor of Gonderic, died in 477. The Vandals had passed the Alps and the Pyrenees, and devastated and conquered a large part of Spain. In 429, when the weak and debauched Valentinian III. occupied the throne of the crumbling western empire, they were called to the province of Africa by Boniface, the governor, who had been induced by intrigues and the fear of a rival to betray his master. Eager for conquest, these northern barbarians prepared a fleet, and were ready to embark when the unexpected attack of Hermanric, king of the Suevi, and the ravages of this people on the possessions of the Vandals, delayed their departure. Having routed the Suevi in a bloody battle near Augusta Emerita (Merida), Genseric embarked with about 50,000 men, crossed the straits of Gibraltar, and conquered within two years all the cities in Mauritania. When Boniface, repenting of his crime, desired Genseric to return to Spain, he refused and could not be expelled; but he at last agreed in a treaty (435) to be satisfied with Mauritania and Numidia. But the native inhabitants of the Atlas mountains, so long oppressed by the Roman governors, and the Donatists, driven to despair by the persecutions of the orthodox church, joined the standard of Genseric, who soon took up arms again and subdued the whole province of Africa. In 439 he took Carthage and made it the capital of the Vandal empire, which now extended over the whole coast, and by piratical expeditions was established in parts of Italy, Sardinia, and Corsica. The attacks of the Huns in the north of the Roman empire made these aggressions on its southern provinces easier, and it was Genseric who invited Attila to his fatal march to Gaul (451). Rome escaped the hands of the Huns, but fell into those of the Vandals. Invited, as is said, by Eudoxia, widow of Valentinian III., who wanted to avenge the murder of her husband by Maximus, Genseric crossed the Mediterranean, sailed up the Tiber, took Rome, pillaged it for 14 days (June, 455), carried away Eudoxia and her daughters, one of whom he gave to his son Hunneric, and sent the Roman treasures and captives to Carthage. All the shores of the Mediterranean, from Asia Minor and Egypt to the straits of Gibraltar, were now ravaged by the Vandals. A fleet, sent by the emperor Majorian (457) to check these ravages, was destroyed in the bay of Cartagena; nor was another sent by the Byzantine emperor Leo (468) more successful; and Genseric reigned victoriously until his death. He was of middle stature, lame of one leg in consequence of a fall from a horse, slow and cautious in his speech, cunning, treacherous, cruel, an able general, and a skilful ruler. Professing the Arian creed, he compelled those who adhered to the orthodox faith to leave his domains, and when they remained treated them as slaves. He was succeeded by Hunneric.

GENTIAN, in medicine, the root of the plant *gentiana lutea*, growing wild in the mountainous portions of Europe, and imported into the United States from Germany. Some other species are also used for medicinal purposes.

well borne when there is any irritation or inflammation of the mucous membrane of the stomach. The tincture contains a large proportion of alcohol, and its physiological and therapeutical value is affected by this ingredient, whose presence should not be forgotten by those who take or administer it. A craving for ardent spirits may be engendered by the long continued use of tincture of gentian and similar tinctures.—Besides the native gentian mentioned above, there are several others found in the Atlantic states, among the most conspicuous of which is the closed gentian, *G. Andrewsii*; the inflated club-shaped blue corolla of this species never opens at the mouth. One of the most beautiful of all wild flowers is the fringed gentian, *G. crispa*, a much-branched annual or biennial species found in low grounds in autumn; the corolla is about two inches long, the tube and its elegantly fringed lobes of a

Gentiana lutea.

One of these, known as the blue gentian (*G. Catesbei*), is found in the grassy swamps of the Carolinas, and so closely resembles in its properties the officinal gentian, that it is used at the south, and is introduced into the catalogue of the United States pharmacopœia. Its flowers are blue; those of the foreign gentian are yellow, which is also the color of the powdered root. Both have at first a sweetish taste, followed by intense bitterness; and both yield their medicinal qualities to water and alcohol. Its bitter principle, called gentiopicroine, is soluble in water and alcohol, and is neither an acid nor an alkaloid, but ranks as a glucoside. The Swiss and Tyrolese macerate the plant in cold water, and the sugar it contains causing it to ferment on standing, they distil from it a spirituous liquor, bitter and unpleasant, but much used by them. As a tonic it has been used from remote times, and the name is said to have been given to it from Gentina, a king of Illyria. It is found as an ingredient in many of the ancient receipts transmitted from the Greeks and Romans. Its effects closely resemble those of the other pure bitters, such as quassia and colombo. In small doses and in suitable cases it increases the appetite, and invigorates digestion. In large doses, or in cases to which it is not adapted, it is liable to disagree with the stomach, exciting nausea and irritating the bowels, and cannot therefore be administered without due reference to the condition of these organs. It is given in powder, in extract, infusion, tincture, or sirup. The powder has been used as an external application to ulcers. In convalescence from fevers and acute diseases, when there is little appetite and a feeble digestion, gentian often increases the former and aids the latter. It is not

Gentiana Andrewall.

deep sky-blue. The alpine gentians, *G. acutalis*, *G. verna*, *G. Pyrenaica*, and others, which are among the gems of European flower gardens, are rarely seen in this country, as our soils become too dry in summer to suit their alpine nature.

GENTILES (the equivalent of the Heb. *goyim* and Gr. *ἔθνη*), the name by which the Jews distinguished all other nations or *gentes* from themselves. In its religious bearing it nearly corresponded to our word heathen; for all who were not Jews, and circumcised, they regarded as excluded from all the religious privileges and relations by which they were so greatly exalted. In the writings of St. Paul the gentiles are generally denoted as Greeks. The court of the gentiles about the temple was the outer space, marked off by a wall or balustrade breast high, within which strangers were forbidden to enter, though they might come as far as the barrier to present their offerings. This explains the meaning of Paul,

when he speaks of "the middle wall of partition" between Jews and gentiles as being broken down by the gospel.

GENTILESCHI, Orazio, an Italian painter, whose family name was Lomi, born in Pisa in 1563, died in London, or according to some authorities in Rome, about 1646. At the invitation of Charles I. he took up his residence at the court of England, and decorated the palace at Greenwich and other buildings. Vandyke included him in his portraits of 100 illustrious men.

GENTRY, a N. W. county of Missouri, intersected by Grand river and drained by its E. and W. forks; area, about 500 sq. m.; pop. in 1870, 11,607, of whom 56 were colored. The chief productions in 1870 were 61,765 bushels of wheat, 640,951 of Indian corn, 135,555 of oats, 44,929 of potatoes, 177,884 lbs. of butter, 52,641 of wool, and 11,082 tons of hay. There were 5,516 horses, 4,014 milch cows, 7,553 other cattle, 18,756 sheep, and 20,585 swine; 3 flour mills, 14 saw mills, and a woollen factory. Capital, Albany.

GENTZ, Friedrich von, a German diplomatist and publicist, born in Breslau in 1764, died in Vienna, June 9, 1832. He was considered a dunce until, in his 21st year, he attended Kant's lectures at Königsberg, when his mind was awakened, and he became familiar with the Greek and Roman classics, and mastered French and English. Returning to Berlin, where he had previously studied, he became a favorite in the highest circles, and commenced a career of gallantry, adventure, and authorship. In 1793 he published a translation into German of Burke's "Essay on the French Revolution," with copious notes. In 1794 he translated and annotated Mallet du Pau's book on the same subject, and in 1795 Mounier's. In 1799 he visited England, and for 20 years he was in correspondence with leading members of the British ministries, for whom he drew up many papers on taxation and finance. In 1802 he visited Vienna, and on Sept. 6 of that year was engaged by the emperor Francis as a councillor. He was sent to England to negotiate an alliance, and drew up the Austrian manifesto of 1805. Gentz was furiously assailed in Napoleon's bulletins, and as the court of Vienna was fearful of being compromised by his further presence, he was directed to leave the capital, and for a time he used his skilful pen in combating Napoleon in Prussia. He was recalled to Vienna by Metternich in 1809, wrote the Austrian manifesto of that year, and subsequently proved himself merely the tool of his employer. He took an active part in the congress of Vienna, assisted in framing the treaty of the holy alliance, and acted as secretary at the congresses of Aix-la-Chapelle, Troppau, Laybach, and Verona. He wasted his talents in sophistical pleas for reaction and political quietism, and his means in extravagance and dissipation. His diaries were found among the literary remains of Varnhagen von Ense and published in 1861 (complete ed., 2 vols.,

Leipsic, 1874). His *Briefe an Pilat*, a contribution to recent German history, was edited by Karl Mendelssohn-Bartholdy, with a biographical notice (2 vols., Leipsic, 1868).

GENUS, a closely allied group of animals or plants, characterized by ultimate structural peculiarities. Great confusion prevails among describers in the formation of genera, from their considering form and complication of structure as generic characters, whereas the former is characteristic of families, and the latter of orders; hence generic, family, and ordinal characters are mixed up in the determinations of almost all naturalists from Linnæus to the present time, and genera have been unnecessarily and absurdly multiplied. Genera are subdivisions of families, and species are subdivisions of genera; the former, as has been stated, are limited by ultimate structural peculiarities, while the latter bear a closer relation to each other and to their special localities, their existence being also confined within a definite period. Generic peculiarities extend to the most minute details of structure of teeth, hair, scales, cerebral convolutions, distribution of vessels, arrangement of intestinal folds and appendages, and microscopic anatomy of the organs; so complete is this identity of structure that (in the words of Agassiz, "Essay on Classification," part i., chap. 1) if an animal were "submitted to the investigation of a skilful anatomist, after having been mutilated to such an extent that none of its specific characters could be recognized, yet not only its class, or its order, or its family, but even its genus, could be identified as precisely as if it were perfectly well preserved in all its parts." Every species of the genus *vulpes* (fox), for example, has the same dental formula, toes and claws, and other generic characters, whether arctic, tropic, or temperate, American, European, or Asiatic, in its habitat. Genera may or may not resemble each other in form; they usually have a wide geographical range, and are less modified in their characters by physical and external agencies. The generic distinctions of the *testudinata* or tortoises, both land and marine, founded principally on the characters of the skull, jaws, skin, and feet (see Agassiz, "Natural History of the United States," vol. i.), give an admirable idea of what constitutes a genus, as distinguished from families and orders.

GEODE, a hollow shell of stone, commonly of quartz, found in various rocks, and usually lined with crystals pointing toward the centre. These crystals are for the most part of quartz, often amethystine. Among the amygdaloids of the trap are found geodes of agate and chalcedony, the shell made up of concentric layers of these variously colored silicious matters. Besides quartz crystals, others of calcareous spar, analcime, &c., are found in the cavities of geodes. Some of the most remarkable specimens of this kind in the quartz geodes are found in low stages of water loose in the rapids of the upper Mississippi river. Externally they are

rough and unsightly, of light brown color, and of all sizes up to 12 or 15 inches in diameter; when broken they present beautiful groups of quartz crystals. Water is sometimes found in the geodes holding the siliceous solution, and making with it a milky-looking mixture. As the water evaporates the siliceous has been known to suddenly form into delicate crystals. Such geodes were at one time abundantly found on Brier creek in Scriven or Burke co., Ga., in a rock composed of hornstone and jasper; the milky fluid contained in them was used by the inhabitants as a paint or whitewash. ("American Journal of Science," vol. viii., p. 286.)

GEODESY (Gr. *gē*, earth, and *daiwō*, to divide), the science and art of laying out divisions of the earth's surface upon a large scale. It differs from ordinary surveying in its measurements, being constantly referred to the spherical surface upon which they are made, and reduced to the same horizontal level. Corrections also are made for horizontal parallax in computing the value of instrumental observations, and the calculus of probabilities is applied to resolve their differences. Its object may even be the determination of the spherical curvature of portions of the surface, which is accomplished by the aid of extended series of astronomical observations made in connection with the most exact measurements. The methods of conducting these operations, and contending with the numerous causes of error incident to the imperfection of the instruments and powers employed, are treated in the article **COAST SURVEY**. The most important results in regard to the figure and dimensions of the earth, deduced from a comparison of the most extensive and accurate geodetical surveys, are given in the articles **EARTH** and **DEGREE**.

GEOFFREY OF MONMOUTH, an old English chronicler, born about 1100, died about 1154. He is supposed to have received his education in the Benedictine monastery near Monmouth, where he compiled his *Chronicon sive Historia Britonum*, to which he probably owed his promotion in 1152 to the see of St. Asaph. Geoffrey's chronicle professes to be a translation from an old Welsh manuscript which one Walter Calenius, an archdeacon of Oxford, discovered in Brittany, and which he requested him to render into Latin. That some part of the work is a translation there seems to be no doubt, as its main features agree with the history of Nennius, written several centuries previous; but so numerous are the legends and fables interwoven into it, and so extensive is the period it embraces (from Brut, the great-grandson of Æneas, to the death of Cadwallader or Cadwalla, king of Wessex, in 688), that its historical value is very inconsiderable. If historians are inclined to doubt the veracity of Geoffrey, the readers of romance are indebted to him for having preserved and perhaps reconstructed the legends of Arthur and his knights. The work was originally divided into eight books, to which Geoffrey added the book

of Merlin's "Prophecies," and was first printed at Paris in 1508. The best recent editions are those of J. A. Giles (1842) and Bohn (1848), both of which are reprints from a translation by Aaron Thompson published in 1718.

GEOFFRIN, Marie Thérèse, a French lady, born in Paris, June 2, 1699, died there in October, 1777. Her father, M. Rodet, was in the service of the dauphiness. She was barely 15 when she married M. Geoffrin, a manufacturer, who was ridiculed on account of his mental inferiority to his wife, but whose fortune enabled her to dispense hospitalities to distinguished persons. She became a widow in a few years, and remained to the end of her life one of the most conspicuous leaders of European society. She counted among her friends Diderot, D'Alembert, Horace Walpole, Hume, and Gibbon. Count Stanislas Poniatowski was a constant visitor at her house, and she rescued him from prison by paying his debts. When elected king of Poland in 1764, he said to her, *Maman, votre fils est roi*. On her visiting him at Warsaw in 1766, the leading members of the Polish nobility came to meet her on the road, and the king had a residence prepared for her. Passing through Vienna, she was received with great distinction by the empress Maria Theresa and her son Joseph II. She was unceasing in her assistance to literary men, especially to those connected with the *Encyclopédie*, toward the publication of which she is said to have contributed more than 100,000 francs. Though intimately associated with philosophers and free thinkers, she was somewhat of a devotee, and her daughter, who became the wife of the marquis de la Ferté-Imbault, attempted to wean her altogether from intercourse with her former friends. But it was only during the last year of her life that she was prevailed upon to deny her society to the encyclopædists. Morellet published in 1812 *Éloges de Madame Geoffrin*, comprising his eulogy of her and those by D'Alembert and Thomas, and several of her letters.

GEOFFROY SAINT-HILAIRE, I. Étienne, a French zoologist, born in Étampes, April 15, 1772, died in Paris, June 19, 1844. He was educated for an ecclesiastical life, but evinced a taste for natural philosophy, and had gained some proficiency as a mineralogist when the revolution broke out. Having been incarcerated as a recalcitrant priest, his pupil managed to procure his liberation, and at the peril of his life he rescued 12 other priests from prison, on the very eve of the massacre of September, 1792. A few months later he was appointed to a subordinate office in the *jardin des plantes*, and in 1793, on the reorganization of this establishment under the name of museum of natural history, he was made professor of zoology. Through his exertions, the old specimens were put in order, new ones were procured, and the zoological collections became the richest in the world. In 1795 he welcomed to Paris George Cuvier, then entirely unknown

to fame. In concert they pursued researches in comparative anatomy, and at that time each of them had but a faint conception of the opposite systems upon which they were to separate 35 years later. In 1798 Geoffroy was one of the scientific commission that accompanied Bonaparte to Egypt; remaining there until the surrender of Alexandria in 1801, he was one of the founders and most active members of the Egyptian institute, thoroughly explored the country, gathered valuable collections of natural specimens, and carried them to France. The papers in which he described these specimens attracted general attention, and resulted in his election to the academy of sciences in 1807. In 1809 he was appointed professor of zoölogy in the faculty of science at Paris, which post he filled for years simultaneously with that at the museum. From 1812 to 1815 his scientific occupations were partly interrupted by sickness and political activity. He was a member of the chamber of deputies during the hundred days; but on the second restoration he returned to his wonted pursuits. He applied himself to demonstrating the principle of which Buffon and Goethe had had but a glimpse, the unity of organic composition among the various kinds of animals; and he founded what he called the "theory of analogues." The unity of composition, according to his idea, is the law of identity in the materials composing the organs of animals of different families, and which, although infinitely varying in shape, bulk, and use, are still the same in all, and discover a single plan; while the theory of analogues is the method through which the unity of composition is demonstrated. As to the unequal sizes among the various creatures, and monstrosities in individuals, they are explained by the principle of arrest of development. These principles, at once bold and original, were in direct contradiction to those which Cuvier had adopted as the basis of his comparative anatomy; and this opposition, which had been silently going on for years, at last broke out openly, July, 1830, in the sittings of the academy of sciences. The contest between the two illustrious champions caused a deep sensation throughout the scientific world of Europe. Notwithstanding the superiority of Cuvier as an orator and scientific expounder, the victory was left undecided, and many among the learned sided with Geoffroy, whom Goethe hailed as an apostle of the true synthetic doctrine. Whatever may have been his faults, he is incontrovertibly, after Cuvier, one of the most important contributors to the advancement of the science and philosophy of natural history. His views contain much of the transcendental element of the German physio-philosophers, and, if carried to their legitimate conclusions, lead to doctrines directly opposed to the prevalent philosophy of final causes. (See PHILOSOPHICAL ANATOMY.) Among his numerous works and papers, which embrace nearly all branches of zoölogy, we

refer specially to the following: *Philosophie anatomique* (3 vols. 8vo, 1818-'22), which contains the exposition of his doctrine; *Principes de la philosophie zoologique* (8vo, 1830), which gives a synopsis of his discussions with Cuvier; *Études progressives d'un naturaliste* (4to, 1835); *Notions synthétiques de philosophie naturelle* (8vo, 1838); *Fragments biographiques* (8vo, 1838); *Histoire naturelle des mammifères*, in conjunction with Frédéric Cuvier (fol., 1820-'42). He also contributed to several great publications, and especially to the description of Egypt by the scientific commission of which he was a member. It was not till 1840 that he gave up active life on account of blindness; a few months later he had a stroke of paralysis; but he withstood his last sufferings with admirable equanimity. His eulogy was delivered by M. Flourens in 1852 at the academy of sciences. An excellent biography had been previously published by his son under the title *Vie, travaux et doctrine scientifique d'Étienne Geoffroy Saint-Hilaire* (Paris, 1847). II. *Isidore*, a French zoölogist, son of the preceding, born in Paris, Dec. 16, 1805, died there, Nov. 10, 1861. Under the direction of his father he devoted himself to natural philosophy, became assistant naturalist at the museum when only 19 years old, and in 1830 delivered zoölogical lectures in that institution as his father's substitute. Three years later he was elected to the academy of sciences. He was then publishing a great work in which he enlarged upon a branch of the natural system outlined by his father; this was his *Histoire générale et particulière des anomalies de l'organisation chez l'homme et les animaux, ou traité de tératologie* (3 vols. 8vo, with an atlas, 1832-'6). On its completion he was appointed assistant lecturer to his father at the faculty of sciences, afterward filled some important offices in the university, and in 1850 resigned the post of general inspector to resume the chair of zoölogy. He devoted his leisure to his *Histoire naturelle générale des règnes organiques*, of which but two volumes were published (1854, 1859). He also paid much attention to the domestication of foreign animals in France, as appears from his treatise *Domestication et naturalisation des animaux utiles* (1854), and advocated the use of horse flesh as food in his *Lettres sur les substances alimentaires, et particulièrement sur la viande de cheval* (1856).

GEOGRAPHY (Gr. γῆ, the earth, and γράφειν, to write), the description of the earth. The science comprises three principal divisions: mathematical, physical, and political geography. Mathematical or astronomical geography treats of the figure, magnitude, and motion of the earth; of the construction of globes, and the solution of problems; of the mode of determining the position of places on the earth's surface, and of representing any portion of that surface on maps or charts. Most of these topics belong as much to astronomy as to geography. (See ASTRONOMY, and EARTH.) Physi-

cal geography treats of the earth and its features of land, water, and air, its animal and vegetable inhabitants, without reference to national or political divisions. (See PHYSICAL GEOGRAPHY.) Political geography describes the countries and nations of the earth as they are politically divided, and deals with mankind in their social aspect and organization. The details of this branch of the science will be found under the names of the various countries, cities, and towns. The Phœnicians were the first who made any great progress in extending the bounds of geographical knowledge. They explored all the coasts of the Mediterranean, and at an early period passed the strait of Gibraltar, and visited the Atlantic shores of Europe and Africa, extending their voyages northward and northeastward as far as Britain and the Baltic coasts, and southward to the tropic of Capricorn. Their neighbors, the Hebrews, probably acquired from them some knowledge of distant lands. In the Scriptures the remotest regions mentioned are, to the north, Gomer (Gen. x.), which probably designated the Kimmerii of Herodotus, and Kir, the Caucasian region of the Kur; to the east, India (Esther i. 1), and very probably China, called the distant "land of Sinim" (Isaiah xlix. 12); to the south, Cush (Ethiopia), Ludim or Lubim (Libya), Dedan (on the Persian gulf), Sheba (S. W. Arabia), and Ophir, concerning whose situation many conjectures have been made, the most probable of which seems to be that it was in southern Asia. To the west, the extreme land was Tarshish, which was probably Tartessus in Spain, though various other identifications have been attempted by critics. The first attempt to enlarge the bounds of geographical knowledge by an exploring expedition was made by Necho, king of Egypt, shortly before 600 B. C. He sent down the Red sea into the Indian ocean a fleet manned by Phœnicians, which in the third year, after circumnavigating Africa, reached the pillars of Hercules or strait of Gibraltar, and returned to Egypt by the Mediterranean. The Phœnicians asserted that during a part of the voyage the sun was in the north. This statement, which shows conclusively that they must have sailed to the south of the equator, Herodotus, naturally enough, wholly discredited. The geographical knowledge of the ancients was greatly enlarged by the Carthaginians, whose extended commerce led necessarily to long voyages, but the only authentic account of any of their maritime expeditions which has reached us is that of Hanno, the time of which is uncertain, but is plausibly conjectured to have been in the 5th century B. C. With 60 vessels he passed the strait of Gibraltar, and sailed down the coast of Africa, as some writers suppose, to the gulf of Benin, while according to others he proceeded no further than the river Nun. About 320 B. C., Pytheas, a seaman of Massilia, the modern Marseilles, sailed out into the

Atlantic, coasted the shores of Spain and Gaul, visited Britain, and passing onward discovered an island, which from that time was famous among the ancients as *Ultima Thule*. Some modern geographers have conjectured that this was Iceland, others that it was Jutland, and others that it was Shetland; but nothing certain is known about it. In a second voyage he passed into the Baltic. The expedition of Alexander the Great, 330 B. C., greatly enlarged the knowledge of India. He penetrated to the Hyphasis, the modern Sutlej. The ambassadors of Seleucus, one of his successors, reached the Ganges and visited the city of Palimbothra, which was probably on or near the site of the modern Allahabad. Beyond this the Greeks seem to have known little or nothing of eastern Asia. The first systematic attempt at scientific geography was made by Eratosthenes, who flourished at Alexandria in the latter part of the 3d century B. C. The globular form of the earth was at this time known to the scientific schools of Alexandria, and the system of Eratosthenes was based upon its recognition, though he disregarded the great primal features of modern geographical science, the equator, the poles, and the tropics. The base line of his geography was a parallel drawn through all the places where it was supposed that the longest day was 14½ hours. It stretched from Cape St. Vincent in Spain eastward through Rhodes, Asia Minor, Persia, and India, till it terminated at the city of Thina, which was supposed to be on the shores of the eastern ocean, at the utmost extremity of the earth. The length of this line, according to Eratosthenes, was about 70,000 stadia, or a little more than 8,000 English miles. At right angles to this Eratosthenes traced a meridian which passed through Rhodes and Alexandria southward, through Syene and Meroë, till it reached what was supposed to be the uninhabitable region, the northern bounds of which were fixed at 12 degrees from the equator. Thule was regarded by Eratosthenes as the extreme northern end of the earth, and the distance from there to the habitable limit toward the equator was computed at 88,000 stadia, or nearly 4,400 miles. Beyond these limits it was commonly supposed that nothing existed but an impassable ocean, though Eratosthenes cautiously conjectures that continents and islands might be reached by sailing westward. Hipparchus, a Bithynian who lived at Rhodes and Alexandria about the middle of the 2d century B. C., carried still further the system adopted by Eratosthenes, and subjected the whole science of geography to astronomical principles. He made numerous observations of latitude in addition to the few previously existing, and pointed out the mode in which longitudes might be ascertained by observing the eclipses of the sun and moon. But his discoveries were neither appreciated nor applied to any practical use till long after his time. About a century and a half after

Hipparchus, Strabo, a Greek of Pontus and a great traveller, wrote a geography which embodies all that was known of the science at the beginning of the Christian era. The countries immediately around the Mediterranean were known with tolerable accuracy; but the Atlantic shores of Europe were very erroneously comprehended, while of the northern and eastern portions only the vaguest ideas were entertained. Nothing whatever was positively known of Scandinavia, Russia, or northern Germany. The extent of Europe to the east and northeast was greatly exaggerated, while that of Asia was proportionally underrated. Nothing was known of Siberia, Tartary, China, Japan, or the great Asiatic archipelago. The Ganges was thought to have throughout an easterly course, and to flow into the eastern ocean. The Caspian was supposed to be the limit of the earth to the north, and to be connected with the eastern ocean by a sea occupying the space now known to be covered by Siberia and Tartary. Of Africa only the northern part was known, south of which was thought to be an uninhabited and uninhabitable torrid zone. The belief in the probability of circumnavigating Africa, which had existed in previous ages, was rejected by Strabo, though he held to the theory of an encircling ocean. The earliest Roman geographer was Pomponius Mela, who wrote about the time of the emperor Claudius. In his treatise *De Situ Orbis* he explains the division of the world into two hemispheres: the northern that part of the earth which is known, the southern that which is unknown. The former is divided into three great divisions, Europe including all N. of the Mediterranean and W. of the Tanais, Africa all S. of the Mediterranean and W. of the Nile, and Asia all the remainder. A still more famous geographer was Ptolemy, who lived at Alexandria about the middle of the 2d century after Christ. At this period the Roman empire had reached its greatest extent, and all its provinces had been surveyed and were well known. Large advances had been made in the knowledge of the countries outside of the empire. The notion of a circumambient ocean had been given up, and an indefinite expanse of *terra incognita* substituted as the supposed boundary of the world. Africa was represented as stretching indefinitely south, and it was even carried round to join the east of Asia, so that the Indian ocean was enclosed like the Mediterranean. In Europe, Spain and Gaul were for the first time correctly delineated, together with the southern part of Britain. The outline of Scotland and the relative position of Ireland are very incorrectly given. Thule is laid down as an island upward of 100 m. long. From its position it is probable that some part of Norway was meant. Northern Germany and the southern line of the Baltic coast were tolerably well known, as was also some portion of Russia in the neighborhood of the

Baltic and the southern part of Russia in Europe. In Asia, great regions had become known sufficiently to make it certain that they were inhabited by nomad tribes called Scythians, while from the far east some vague report of China and of the regions now known as Chin-India had reached the geographer. From the time of Ptolemy till the revival of letters in Europe little progress was made in geographical knowledge. In the 9th century, however, the Northmen discovered Greenland, and in the 10th, according to their sagas, visited the North American continent. In the 13th century missions were sent by the popes into remote parts of Asia. Father John de Plano Carpini, with some Franciscan monks, was sent in 1246 by Innocent IV. to Kayuk Khan, the Tartar emperor, and penetrated as far as Thibet. In 1258 Rubruquis, another Franciscan, was sent by Louis IX. of France in search of Prester John, and penetrated further into Asia than any European ever had before. But the greatest discoveries in this quarter were made by Marco Polo, a Venetian, who in 1271 set out with his father and uncle on a journey to the court of Kublai Khan, the Tartar conqueror of China. After travelling for more than three years they reached Yehking, near where Peking now stands. Marco Polo resided 24 years in the East, and on his return gave an account of his travels, which first made known to Europe the existence of Japan and many of the East Indian islands and countries. In the 15th century the spirit of enterprise and geographical exploration was strongly aroused in Europe. Portugal took the lead, and made great and systematic efforts to explore the unknown countries on the W. coast of Africa. In the year 1412 Cape Nun was doubled, and soon afterward the islands of Porto Santo and Madeira were discovered. In 1484 Benin and Congo were discovered, and the coast explored for 1,500 m. S. of the equator. In 1486 the cape of Good Hope was reached, and 11 years later doubled by Vasco da Gama. But the greatest of all geographical discoveries was that of the new world by Christopher Columbus in 1492. From this time forward the progress of geographical exploration was exceedingly rapid. Within 80 years from the date of the first voyage of Columbus the whole E. coast of America from Greenland to Cape Horn had been explored, and Spanish keels were floating on the Pacific ocean. In 1520 Magalhaens passed the strait which bears his name, crossed the Pacific, and although he was killed in the Philippine islands, his vessel, crossing the Indian ocean, returned to Europe by way of the cape of Good Hope, having been the first to circumnavigate the globe. The W. coast of America, with the exception of that portion N. of the bay of San Francisco, was explored before the middle of the 16th century, while considerable progress was made by the Spaniards in acquiring a knowledge of the interior of

South America. At the same time discovery in the East advanced with rapid strides. Within 20 years from the time of Gama's arrival in India, the coasts of E. Africa, Arabia, Persia, Hindostan, and Further India had been explored, and many of the islands of the great archipelago discovered. In the 16th and 17th centuries the progress of astronomical science led to a general revision of Ptolemy's tables of latitude and longitude, which had for ages been received with implicit confidence, but which more accurate observations now proved to be generally erroneous. In the 18th century many learned and laborious writers, among whom D'Anville may be particularly mentioned, applied themselves to the rectification of the whole system of ancient geography, and to the identification of ancient with modern countries, cities, rivers, mountains, and other features. The desire to discover a shorter route to India than those by Cape Horn and the cape of Good Hope led the English and the Dutch in the 16th century to make daring and persevering efforts to effect a N. E. and a N. W. passage. For a long time the opinion prevailed that the northern extremity of America terminated, like the southern, in a point or cape, by sailing around which the mariner could enter the Pacific ocean and make his way to India. The expeditions of Sir Hugh Willoughby and Richard Chancellor in 1553, of Frobisher in 1576-'8, of Davis in 1585-'7, of Barentz in 1594-'6, in search of this northern route, greatly enlarged the knowledge of the arctic regions, and especially of the N. E. part of North America. So, too, in the succeeding century, a similar result followed from the voyages of Henry Hudson in 1607-'11, and of William Baffin in 1612-'16. It was not till the latter part of the 18th century, however, that the great breadth of the upper part of North America became fully known from the investigations of Capt. Cook in his voyages to the Pacific. The determination of the distance from Behring strait to the E. coast of North America dispelled for a time all expectation of a N. W. passage; it was supposed that the continent stretched in one unbroken mass to the pole. The discoveries of Hearne in 1771 and of Mackenzie in 1789, by showing that an ocean bounded America on the north, dispelled these ideas, and in 1818 the attempt to effect the N. W. passage was revived by an expedition commanded by Capt. Ross. This was the beginning of a series of English and American expeditions to the arctic regions which have greatly advanced our knowledge of that part of the world, though without attaining the object for which they were commenced. (See ARCTIC DISCOVERY.) Early in the 17th century the Dutch, while seeking for a southern continent whose existence was supposed necessary to balance the northern, discovered Australia, which they called New Holland, and explored a considerable portion of its coasts. In 1642

Tasman discovered Van Diemen's Land, or Tasmania, as it is now called. Soon afterward he discovered New Zealand and several of the Polynesian groups. His explorations proved that New Holland was an island, and not a part of the southern continent. The famous Capt. Cook in his voyages, 1768-'79, made strenuous efforts, without success, to discover the southern continent; but he added largely to geographical knowledge by his survey of the Pacific ocean and its innumerable islands. An expedition sent out by the United States in 1838, under command of Lieut. Wilkes, in 1842 discovered a continent within the antarctic circle, portions of which had been seen shortly before by the French and English navigators Dumont d'Urville and Sir James Ross. (See ANTARCTIC DISCOVERY.) Our acquaintance with the interior of Asia has been greatly advanced within the last two centuries by Russian, English, and French conquests, and by a multitude of travellers, prominent among whom have been the Jesuit missionaries, so that our general knowledge of that continent is tolerably complete. No great *terra incognita* remains, though fuller and more precise information about the vast regions known as Tartary is much to be desired. The travels of Humboldt, of Lewis and Clarke, and of Fremont have enlarged our acquaintance with the interior of the American continent; and during the last few years much light has been thrown upon it by the various exploring expeditions sent out by the government, and especially by companies of professors and students from our colleges. The interiors of Australia and of Africa are still only partially known. Much has been done for the exploration of the former by Sturt, Eyre, Leichardt, Stuart, McKinlay, Landsborough, Burke, the brothers Gregory, and others; while in Africa a host of travellers have struggled for a century past to penetrate the mystery which envelops that great division of the globe. Foremost among the African explorers have been James Bruce, Mungo Park, Major Denham, Lieut. Clapperton, Richard Lander, Captains Burton and Speke, Dr. Livingstone, Dr. Barth, Henglin, and Sir Samuel Baker. Great additions to our knowledge of the countries on the upper Nile have been made by expeditions sent by the pasha of Egypt, which have penetrated far beyond the region so long assigned on our maps to the mountains of the Moon. These expeditions and the researches of Barth, Burton, Livingstone, Baker, and the missionaries Reimann and Krapf, have left in obscurity only a portion of that part of Africa which lies between lat. 10° N. and 10° S., and lon. 12° and 27° E. Dr. Livingstone at the time of his death was endeavoring to penetrate this region.—The remarkable progress of geographical discovery during the present century may be thus briefly summed up: Northern Asia has been traversed by the expeditions sent out by the Russian government; the great fields

of central Asia have been crossed in various directions; our knowledge of China has been vastly increased; the newly awakened desire of the Japanese to participate in the advantages of European civilization has broken down much of their ancient prejudice against foreigners, and bids fair to introduce us to an intimate and exact knowledge of their country; Palestine has been explored with wonderful minuteness; the interior of Arabia has been penetrated; the sites of many of the most renowned cities of antiquity have been determined; the Niger and the Benouwe or Tchadda have been traced almost throughout their extent; the Nile has been traced to the great lakes in the equatorial regions of Africa; Madagascar and Australia have been crossed in various directions from sea to sea; the icy continent about the south pole has been discovered; the delineation of the N. shore of the North American continent has been completed; the principal features of the geography of that vast portion of our own territory lying between the Mississippi and the Pacific have been ascertained, and its sublime scenery has been described; and the river systems of South America have been explored. With the exception of the regions about the poles and in the centre of Africa, the general outlines of every part of the earth's surface are known to civilized man. —The literature of geography, to which the school of Carl Ritter has given its highest degree of scientific development, has within a few years undergone a marked change. Instead of the formal, regular descriptions of the earth and its inhabitants, which were once in vogue, gazetteers and geographical dictionaries are now popular. The progress of geography has been much aided during this century by the efforts of zealous geographical societies. Their transactions, issued periodically, contain a vast and constantly increasing mass of information. Among the best works on geography are: *Géographie universelle*, by Malte-Brun (6 vols. 8vo, Paris, 1810-'29; revised by Th. Lavallée, 6 vols. 8vo, 1856-'62), the English translation of which was revised by J. G. Percival, who added notes (3 vols. 4to, Boston, 1834); *Die Geschichte der Erdkunde*, by Lüdde (1840); *Geschichte der Erdkunde und der Entdeckungen*, by Carl Ritter (1861); *Geschichte der Erdkunde bis auf Alexander von Humboldt und Carl Ritter*, by O. Peschel (1865); and the works of De Rougemont, Von Roon, Berg-haus, Volger, Merleker, Meinicke, Klöden (*Handbuch der Erdkunde*, 1858-'62; 2d ed., 1865 et seq.), Wappäus (*Handbuch der Geographie und Statistik*, 4 vols., 1855-'71), and Daniel (*Handbuch der Erdkunde*, 4 vols., 3d ed., 1869-'72). For ancient geography, see *Handbuch der alten Geographie*, by Forbiger (3 vols., 1842); Smith's "Dictionary of Greek and Roman Geography" (2 vols. 8vo, London, 1854-'7); Buchholz's *Homerische Kosmographie und Geographie* (1871); and *Deutsche Alterthumskunde: Stellung des Pytheas . . .*

in der Geschichte der Erdkunde, by K. Müllenhoff (1870). The principal geographical gazetteers and dictionaries are: "Encyclopædia of Geography," by Hugh Murray (London, 1884; Amer. ed. revised, 3 vols. 8vo, Philadelphia, 1843; new ed., 1857); "A Dictionary, Geographical, Statistical, Historical," &c., by J. R. McCulloch (4 vols. 8vo, London, 1841; new ed., 1866); Fullarton's "Gazetteer of the World" (7 vols. 8vo, Edinburgh, 1850-'57); "The Imperial Gazetteer," by W. G. Blackie (2 vols., London, 1855; 3d ed., 1878); Ritter's *Geographisch-statistisches Lexikon* (Leipzig, 1855); Lippincott's "Gazetteer of the World" (Philadelphia, 1855; new ed., 1866); Keith Johnston's "Dictionary of Geography" (revised ed., London, 1867); *Dictionnaire de géographie universelle, ancienne et moderne*, by L. N. Besche-relle (4 vols. 4to, Paris, 1856-'8; new ed., 1865); and *Dictionnaire universel d'histoire et de géographie*, by M. N. Bouillet (1 vol., Paris, 1842; 22d ed., 1871). Most of the geographical societies publish periodicals, the principal of which are those of Paris (*Bulletin*, 1822 et seq.), London ("Journal," 1831 et seq.; "Proceedings," 1855 et seq.), Berlin (*Zeitschrift*, 1840 et seq.), St. Petersburg (1848 et seq.), Geneva (*Journal*, 1861 et seq.), and Florence (*Bollettino*, 1867 et seq.). Other valuable geographical periodicals are Petermann's *Geographische Mittheilungen* (Gotha, 1855 et seq.), and its *Ergänzungshefte* or supplements; Saint-Martin's *L'Année géographique* (Paris, 1863 et seq.); and "Ocean Highways" (London, 1871; new series, 1878 et seq.).

GEOLOGY (Gr. γῆ, the earth, and λόγος, discourse), the science which treats of the structure of the earth, and of the methods by which its materials have been arranged. Under this term are confounded two distinct branches of study, the one being that of the chemical, physical, and biological laws which have presided over the development of the globe, and the other the natural history of the earth as displayed in its physical structure, its stratigraphy, mineralogy, and palæontology. The name of geognosy, employed by some authors, may be very appropriately retained for the latter, while that of geogeny may be restricted to the first or theoretical division of geology. A knowledge of physical geography, of the distribution of land and water in past and present times, and of the laws of winds, currents, and climates, is one of the first requisites in the study of geology. Then comes the investigation of the various kinds of rocks, their arrangement and structure, their succession and relative antiquity, their chemical and mineralogical history. The investigation of the chemical agencies which have presided over the formation of the various kinds of rocks and minerals belongs to chemical geology, while the laws which have regulated their deposition, structure, and arrangement constitute dynamical geology. The student finds that organic life in past time played a part in the earth not

less important than it does to-day, and the study of the organic remains found in the various rocky strata, and known as fossil plants and animals, gives rise to departments of botany and zoölogy which are sometimes called palæobotany and palæozoölogy, but are more generally included under the common term of palæontology. The changes that have taken place in the inorganic and organic world introduce in their study considerations of time and progress, and the science is found to be largely of a historical character; the geologist, as Cuvier remarked, being an antiquary of a new order. Its historical element is regarded by Lyell as so prominent that he defines geology simply as "the science which investigates the successive changes that have taken place in the organic and inorganic kingdoms of nature." In the present article little more will be attempted than to present a general sketch of the history and progress of geological science, a reference to some principal objects of its pursuit, and the system of classifying the groups of rocks generally adopted. The history of the science as developed in Europe is minutely traced in the familiar work of Lyell, "Principles of Geology," in which the whole subject may also be most advantageously studied.—From the earliest times the structure of the earth has been an object of interest to man, not merely on account of the useful materials he obtained from its rocky formations, but also for the curiosity awakened by the strange objects it presented to his notice. The south and west of Asia and much of the country bordering the Mediterranean were particularly favorable for directing attention to geological phenomena. Earthquakes were frequent, changing the relative positions of sea and land; volcanoes were seen in operation, adding layers of molten rock to those of sand and mud filled with the shells of the Mediterranean; the strata in the hills abounded in evidences of similar collections of vestiges of marine life far removed from access of the sea, and yet unchanged during the period of human observation and tradition; the Ganges and the Nile, pouring forth their vast sedimentary accumulations, were plainly building up the deltas at their mouths, and the broad valleys reaching far up their course were unmistakable productions of the same series of operations in remote periods. These phenomena could not escape the attention of the philosophers among the ancient Egyptians and Indian races; and their influence is perceived in the strange mixtures of correct observation and extravagant conceit which make up their cosmogonies or universal theories of the creation. In the first chapter of the ordinances of Manu alternating periods of destruction and of renovation are distinctly recognized, extending in eternal succession throughout the whole assemblage of locomotive and immovable creatures, each period comprehending a duration of many thousand ages. The Greek schools of philosophy rec-

ognized these phenomena, which were clearly enunciated by Ovid in presenting the doctrines of Pythagoras. Remarkably free from extravagant statements, they were applied to prove a system of perpetual change slowly modifying the surface of the earth. Aristotle recognized the interchanges constantly taking place between land and sea by the action of running water and of earthquakes, and remarked how little man, in the short span of his life, can perceive of operations extending through the eternity of time. Strabo distinctly applied the raising up of land, not merely of small tracts, but of continents also, by earthquake convulsions, to account for the perplexing phenomenon of beds of marine shells contained in the interior of hills far distant from the sea. Arabian philosophers of the 10th century are also cited who entertained similar views of the changes going on and their causes.—The Italian philosophers in the early part of the 16th century were the first to engage in systematic investigations concerning the true nature of fossil shells. Their abundance in the strata of the sub-Apennine range could not fail to arrest attention and excite inquiries, which were the more perplexing from the limited time allowed in popular belief to the past duration of the earth, and from the general persuasion that no great catastrophe except the Noachian deluge could have occurred to modify its surface. Various fanciful explanations were therefore adopted in the spirit of the scholastic disputations, and for three centuries argumentations were sustained with much spirit on the questions: first, whether fossil remains had ever belonged to living creatures; and secondly, admitting this, whether all the phenomena could not be explained by the deluge of Noah. Among those distinguished for the soundness of their views in the commencement of this controversy are Leonardo da Vinci, the celebrated painter, who died in 1519, and Fracastoro, whose attention was engaged by the multitude of curious petrifications which were brought to light in 1517 in the mountains of Verona, in quarrying materials for repairing the city. He exposed the absurdities of the theories which referred the petrifications to a certain plastic force in nature that could fashion stones into organic forms, and showed the inadequacy of the traditional deluge to bring together the marine fossils that form solid strata of the earth. About this time collections of these curiosities were made for public museums and private cabinets; they were deposited in the museum of the Vatican at Rome, and that of Canceolariis at Verona became famous for them. Descriptive catalogues of these collections were published; and as early as 1565 appeared one of the collection of J. Keutman in Gesner's work *De Rerum Fossilium, Lapidum et Gemmarum Figuris*. In 1580 Palissy was the first who dared assert in Paris that fossil remains of testacea and fishes had once belonged to marine animals. The truth made but slow progress in the face of

established prejudices. In 1669 Steno, professor of anatomy at Padua, published his work *De Solido intra Solidum naturaliter Contento*, in which he proved the identity of the fossil teeth found in Tuscany with those of living sharks, and the close similarity of the fossil testacea to living species; he traced their progressive change from unaltered shells to solid petrifications, and recognized the distinction between formations deposited by salt and by fresh water, and that some were of an earlier period than the introduction of plants and animals upon the earth. But neither he nor Scilla, the Sicilian painter, who in his Latin treatise on the fossils of Calabria, illustrated by good engravings (1670), ably maintained the organic nature of fossil shells, ventured to refer their occurrence in the strata to any other cause than the Mosaic deluge. Leibnitz, the great mathematician, in his *Protogæa* (1680), first proposed the theory of the earth having originally been a burning luminous mass, which since its creation has been cooling down, and as it cooled received the condensed vapors which now compose its crust. In one stage of its formation he believed it was covered with a universal ocean. From these materials Leibnitz traced two classes of primitive formations, the one by refrigeration from igneous fusion, the other by concretion from aqueous solution. The first recognition of the arrangement of the earthy materials in strata, continuous over large areas, and resembling each other in different countries, appears to have been by Dr. Lister, who sent to the royal society of London in 1683 a proposal for maps of soils or minerals. He also believed that species had in past ages become extinct. Dr. Robert Hooke near the close of the 17th century prepared a "Discourse on Earthquakes," which contains the most philosophical views of the time respecting the nature of fossils and the effects of earthquakes in raising up the bed of the sea. William Woodward was a distinguished observer of the geological formations of Great Britain, and perceived that the lines of outcrop of the strata were parallel with the ranges of the mountains. About 1695 he formed a collection of specimens, which he systematically arranged and bequeathed to the university of Cambridge. For this he purchased the original specimens and drawings of fossil shells, teeth, and corals of Scilla. But his geological system was cramped by the attempt to make it conform to the received interpretation of the Scriptural account of the creation and deluge. The Italian geologists Vallisneri in 1721, Moro in 1740, and Generelli in 1749, advanced the most philosophical views yet presented respecting the fossiliferous strata, and sustained them by original observations made by the first two throughout Italy and among the Alps. Moro endeavored to make the production of strata correspond in time to the account of the creation of the world in six days, and hence was compelled to refer them to volcanic ejections, which by floods, he

imagined, were distributed over the surface of the earth and piled up in strata with marvellous celerity. Buffon advanced views respecting the formation and modification of mountains and valleys by the action of water, in his "Natural History" (1749), a portion of which, contained in fourteen propositions, he was required by the faculty of theology in Paris to renounce. This he did in his next work, accompanying the formal abandonment of what he had written contrary to the narration of Moses with a declaration of belief of all contained in the Scripture about the creation, both as to order of time and matter of fact.—Geology did not begin to assume the rank of an important science until its application to the practical purposes of mining was first pointed out in the last quarter of the 18th century by Werner, professor of mineralogy in the school of mines at Freiberg in Saxony. This distinguished man attracted pupils from distant countries, and sent them forth enthusiastic geologists and advocates of the views he had conceived from his imperfect observation of the geology of a small portion of Germany. He taught the systematic order of arrangement of the strata, adopting nearly the same divisions that had been proposed fifty years previously by Lehmann, a German miner. He explained their production as the result of precipitation from a common menstruum or "chaotic fluid," which he supposed had once covered the whole surface of the earth. As expounded by Jameson in 1808, the first precipitates from this ocean were chemical, and produced the crystalline rocks which lie at the base of all the others, and which he designated as the primitive class. They included the granitic rocks and those called crystalline schists, such as gneiss, mica slate, clay slate, serpentine, &c. The second class comprised the rocks he calls transition, certain limestones, flinty slate, gypsum, graywacke, and trap, most of which are probably now included in the palæozoic formations. They were supposed to have been formed during the transition of the earth from its chaotic to its habitable state, and to have been partly chemical and partly mechanical in their origin, and due to the action of the waves and currents. The third class contained the rocks denominated *Flötz*, because as observed in Germany they were disposed in horizontal or flat strata. In this were the coal formation, various sandstones, the chalk, rock salt, gypsum, various limestones, and certain traps. They were supposed to have been formed while animals and vegetables existed in numbers, and to have been partly chemical and partly mechanical in their origin. The fourth class contained the alluvial rocks, those produced on the land, as peat, sand and gravel, loam, bog iron ore, calc tuff, &c., being understood to comprise all above the chalk excepting the volcanic. The fifth class comprised the volcanic rocks, the pseudo-volcanic, and the true volcanic; the former being the supposed products of the combustion

of coal and sulphurous matters, the latter of real volcanoes. These formations were supposed to be systematically arranged; the later formed either entirely covering the older, or, when these form a central mountain mass, encircling this, so that the "outgoings" of the strata (meaning their upper edges or lines of outcrop) form circles; those of the later formed groups being successively larger. The basin and trough-shaped deposits were also recognized, in which the outgoings of the newer strata became successively smaller. The strata, it was understood, were subject to local disturbances from portions sinking into subterranean cavities, and members might be wanting in some localities, but whenever present must be found in their proper position in relation to the others. Basalt, which in Saxony and Hesse was seen capping the hills of stratified rocks, he inferred must be of the same series of precipitated formations, although many other geologists of Werner's time had fully established the analogy between this rock and modern lavas. The observations of Desmarest, especially in the district of extinct volcanoes in Auvergne, made in 1768, are referred to by Lyell as most clearly tracing the origin of the basalts to the craters of the volcanoes. A new controversy now arose, which for many years was waged with animosity and bitterness unprecedented in disputes of this class. Geologists throughout Europe were divided into the two classes of Neptunists, who advocated the production of the rocks by aqueous deposition alone, and Vulcanists, who attributed the origin of many of them to the action of fire. They were also called, from the names of their respective leaders, Wernerians and Huttonians. Dr. Hutton of Edinburgh had studied geology for himself in different parts of Scotland and England, and formed his own conclusions, which he ably sustained. He was the first to announce that geology had no concern with questions as to the origin of things, but that the true field of its investigations was limited to the observation of phenomena and the application of natural agencies to explain former changes. His friend Sir James Hall showed by actual experiment that the prismatic structure of basalt might result in cooling from a state of igneous fusion; and Hutton himself found in the Grampian hills the granite branching out in veins, which extended from the main body through the contiguous micaceous slates and limestone, thus indicating its having been in a fused state at a time subsequent to the production of Werner's primitive rocks. This discovery soon led to questioning the existence of any primitive class of rocks the origin of which lay beyond the reach of the present order of things; and the announcement made by Hutton, "In the economy of the world I can find no traces of a beginning, no prospect of an end," may well have startled men of science and shocked the religious public in the sensitive condition to which it had been

brought by the infidel doctrines promulgated in the latter part of the last century, especially by men of letters in France. The Vulcanists came to be classed with the enemies of Scripture, the true object of investigation was lost sight of, and the controversy was continued with such animosity that the party names at last became terms of reproach, and many geologists avoided being involved in it. Workers in the field, however, were collecting new and valuable data that were to give to the science a more exact character. William Smith, a civil engineer, prepared in 1793 a tabular view of the strata near Bath, tracing out their continuity over extensive areas, and recognizing them by the fossils they contained. This method of identification and of arranging strata in their true positions he taught himself, and was the first to promulgate in England. With extraordinary perseverance he continued to prosecute his work alone, travelling on foot over all England, freely communicating his observations, and in 1815 he completed a geological map of the whole country. In France the importance of fossils as characteristic of formations was also beginning to be appreciated. Lamarck and DeFrance earnestly engaged in the study of fossil shells, and the former in 1802 reconstructed the system of conchology to introduce into it the new species collected by the latter in the strata underlying the city of Paris. Six years previous to this Cuvier had established the different specific character of fossil and living elephants, which opened to him, as he said, views entirely new respecting the theory of the earth, and determined him to devote himself to the researches which occupied the remainder of his life. In 1807 the geological society of London was established, with the professed object of encouraging the collection of data, multiplying and recording observations, with no reference to any "theories of the earth." Its active members completed the classification and description of the secondary formations of Great Britain, so well commenced by William Smith; while at the same time the tertiary formations were thoroughly investigated by Cuvier, Brongniart, and others in Paris. Thus each country contributed to the advancement of geological science in the department connected with its most prominent formations: Germany in that of the lower stratified and crystalline rocks, and especially in the mineralogical structure of these, while in Scotland the character of the granitic rocks had been more particularly elucidated, in England that of the secondary strata and their order of arrangement, and in France the tertiary. The great principles gradually developed by these observations were: that the materials of the stratified rocks were sedimentary deposits that had slowly accumulated in the beds of ancient seas and lakes; that each stratum represented a certain period during which its materials were gathered, and that this period was characterized by its peculiar group of organized beings, the

vestiges of which were buried and remained with it as records of the condition of this portion of the earth during this time. The piles of strata of various kinds indicated changes in the character of the deposits introduced, sandstones formed from sand, alternating with shales formed from muddy and clayey deposits, and with calcareous strata, whose origin may have been in marl beds or the remains of calcareous organisms. The long succession of these strata, in connection with the evidences of their slow accumulation, observed in the undisturbed condition of the fossil remains which they contained, bore witness to long periods occupied in the production of a single group of strata constituting but a minor division of one of the formations. The lapse of long periods was also indicated by the fossils found in beds of older date becoming constantly more and more unlike existing species. The same localities, too, presented in their successive beds some that were filled with marine vestiges alone, corallines and sea shells, in layers of such thickness that ages must have passed while they were quietly accumulating; and above or below these were found other strata indicating that the surface at another period was covered with fresh water, the organic remains which they contained being only of the character of those belonging to ponds and rivers; and yet again these localities became dry land, and were covered with the forests of tropical climes, and peopled with numerous strange species of animals, whose nearest living analogues are met with only in hot countries. Such changes as these also plainly marked slowly progressing revolutions, the period of which no one could compute by years. It was apparent that the sediments had collected as beds of sand and clay now collect in seas and lakes, and especially about the mouths of large rivers; but it was only in such as were evidently the product of the streams of the present day that the organic vestiges were recognized as belonging entirely to familiar species. In these alone were discovered any relics of man or any indications of his existence; and here they were not wanting, for in the calcareous strata in process of formation and filled with recent species of shells human remains have been found. But with the first step backward the bones of extinct gigantic mammalia introduce us to strange groups of animals, and no satisfactory evidence is afforded, either in the strata or in tradition, that man was their contemporary. Thus in the closest connection, geologically speaking, are we presented with the most striking examples of other great principles developed by geological research, viz., the extinction of old and the introduction of new species.—In consequence of the system of observation and close investigation now established, geology lost its highly speculative character, and rapid progress continued to be made in acquiring correct information of the arrangement of the strata of different coun-

tries. While the defects of Werner's classification were exposed, the general plan of it was seen to be founded in nature, and attention was directed to collecting everywhere the materials for filling out the vertical column of the rocks, as well as mapping them throughout their horizontal range. In every country some formations could be recognized, from which as a base a local classification might proceed to contiguous groups, and thus at last the whole be included in one system of classification. So the work of descriptive geology has ever since been going on, new discoveries continually adding to its completeness and helping to the compilation of a perfect system, which in this case should present a full chart of the rocks from the lowest or oldest to the uppermost or newest. Strata lying in juxtaposition in one region, when identified in another, are found to be separated by the interpolation of a new series; and again, in tracing out over broad areas a group of sedimentary strata, they are found gradually to assume new features, and even to undergo an entire change of chemical composition. The deposits over different parts of the ocean's bed are found to be here sands and gravels brought by currents, and there soft calcareous muds, the remains of minute animal organisms accumulated in still waters. The organic remains as well as the mineral character of these contemporary deposits present wide differences. From the mode of their formation it is evident that all stratified formations must be of limited area, and must thin away at their edges, presenting the shape of lenticular sheets lapping upon each other.—In 1819 the geological society of London, through the labors of Mr. Greenough and his friends, published a map of England which was a great improvement upon that of Smith. About the same time Leopold von Buch prepared a similar map of a large part of Germany. A geological survey of France was ordered in 1822 by the French government, by which a complete geological map of France was finally constructed in 1841. M. Bronchant de Villiers, professor in the school of mines, was appointed to take charge of the work, and with him were associated Élie de Beaumont and Dufrenoy. The attention of these geologists was first given to an examination of the strata above the coal formation of England, where they had been most carefully studied and particularly described by Conybeare and Phillips in their treatise on "The Geology of England and Wales" (1821). The secondary strata of Germany also were familiar to geologists; and both countries consequently furnished important points of reference for the arrangement of the groups of France. The chalk formation of Paris, the upper member of the secondary, served as the starting point, and proceeding from this they examined in detail the lower strata as they appeared successively emerging from beneath it, and identified them,

as they could, with the corresponding groups of other countries. Such is the method ever since pursued, by which our knowledge of the strata which make up the outer crust of the earth has been systematically extended. The importance of the organic remains found in the rocks has been more and more appreciated, and the shells constituting the chief portion of these have been most thoroughly studied; for while the different formations or groups of strata may contain numerous similar beds of limestone, sandstone, slates, and shales, not to be distinguished by their mineral characters, and which frequently cannot be traced to their meeting with other known formations by which their place or relative positions may be determined, the fossils show no such indiscriminate distribution. Each period was characterized by its peculiar group of animated beings, and if their arrangement is understood it follows that the position of any stratum in which the fossils are recognized must also be determined. A single species may in some cases be peculiar to one member of a geological formation, and serve wherever the fossil is found to identify the rock; but usually in different countries their identification by fossils is dependent upon characteristic genera and the order of succession of their principal groups. This branch of the subject will be more particularly treated in the article *PALAEONTOLOGY*.—In the latter part of the last and early part of the present century papers upon geological subjects occasionally appeared in the transactions of the American philosophical society of Philadelphia, the transactions of the American academy, and in other scientific journals. The character of these papers is almost exclusively descriptive. There is, however, a theory of the earth proposed by Franklin in the "Philosophical Transactions" of 1793; and in vol. vi. appeared the memorable essay of William Maclure, read Jan. 20, 1809, entitled "Observations on the Geology of the United States, explanatory of a Geological Map." The author of this paper had undertaken a more arduous and gigantic work even than that which was occupying William Smith of England; it was no less than a geological survey of the United States alone and at his sole expense—a work which entitled him to the appellation he has received of the father of American geology. In this pursuit he crossed the Alleghenies fifty times, visited almost every state and territory in the Union, and for years continued his labors mostly among those who could have no appreciation of his objects. He had visited nearly all the mining districts of Europe, and thus was well qualified, for one of that period, to recognize the corresponding formations of the two continents. He traced out the great groups of strata then designated as the transition, secondary, and alluvial, in their range from the St. Lawrence to the gulf of Mexico. The tertiary, however, he did not recognize, owing to the absence of the chalk formation, the upper member of the

secondary, which in Europe, being largely developed and most conspicuous, marks the strata of more recent origin lying above it as tertiary. He continued his explorations after this report, and in May, 1817, presented another to the philosophical society, accompanied by a colored map and sections. His observations were also extended in 1816 and 1817 to the Antilles, and a paper upon the geology of these islands was published in the first volume of the "Journal of the Academy of Natural Sciences." Prof. Silliman of New Haven, educated to the profession of the law, was induced by President Dwight of Yale college to qualify himself for the departments of natural science, particularly chemistry; and with this view he spent some time previous to 1806 in England and Scotland. In Edinburgh he became familiar with the discussions of the Wernerians and Huttonians in that transition period, as he styles it, between the epoch of geological hypothesis and dreams and the era of strict philosophical induction in which the geologists of the present day are trained. The interest excited by this controversy could not fail to direct his tastes toward the new science, and he returned to become its zealous promoter, for half a century or more aiding to elucidate the geology of his country, inspiring the enthusiasm of others, and furnishing in the "American Journal of Science" an organ for the diffusion of scientific knowledge. At that period (1804-'5), he says, geology was less known in the United States than mineralogy. Most of the rocks were without a name, except so far as they were quarried for economical purposes, and classification of the strata was quite unknown. Dr. Archibald Bruce of New York commenced in 1810 the publication of a journal devoted principally to mineralogy and geology, the earliest purely scientific journal supported by original American communications. It was well received at home and abroad, but appeared only at wide intervals, and ended with the fourth number. The mineralogical collections at the principal colleges, and others belonging to scientific men mostly in New York, promoted inquiry and observation concerning the geological relations of the minerals and their distribution. The admirable treatise on mineralogy by Prof. Parker Cleaveland, published in 1816, fostered while it gratified this spirit of inquiry. In 1818 the brothers Prof. J. F. Dana and Dr. Samuel L. Dana published a detailed report on the mineralogy and geology of the vicinity of Boston. In the same year was first published the "American Journal of Science," which has continued ever since to be the chief periodical American recorder of the progress of the sciences. The next year the American geological society held its first meeting at New Haven, where it continued to meet annually for several years. The importance of geological explorations, with the view of thereby ascertaining the agricultural and mineral capacities of large districts, was be-

ginning to be appreciated by communities and public bodies. In 1820 a geological survey of the county of Albany, N. Y., was made under the direction of the agricultural society of the county by Prof. Amos Eaton and Dr. T. R. Beck. Two years afterward Rensselaer and Saratoga counties were also thus explored. Prof. Eaton was also engaged by Gen. Stephen Van Rensselaer to make at his expense a geological survey of the country adjacent to the Erie canal. The result of this was published in 1824 in a report of 160 pp. 8vo, with a profile section of the rock formations from the Atlantic ocean through Massachusetts and New York to Lake Erie, the Rev. Edward Hitchcock furnishing many of the details through Massachusetts. The first geological survey made by state authority was that of North Carolina in 1824 and 1825, by Denison Olmsted. Since that time there have been various surveys by the different states or by the federal government, of which we shall notice the most important historically. Beginning at the northeast, early surveys were made of Maine, New Hampshire, and Rhode Island, by Dr. C. T. Jackson, in 1836-'41; of Massachusetts, by Edward Hitchcock, in 1830-'40; of Connecticut, by J. G. Percival and C. U. Shepard, in 1836, and of Vermont in 1845-'6, a work which was continued by Edward Hitchcock and his son, C. H. Hitchcock, in 1858-'60, the latter of whom is now (1874) engaged in a resurvey of New Hampshire. In 1836 was commenced the survey by H. D. Rogers and his assistants of the state of Pennsylvania, which was not completed till 1855. The survey of New York in 1836-'42, by Vanuxem, Emmons, Mather, and Hall, may be said to have opened a new era in American geology by giving a complete and systematic classification of the palæozoic rocks within its borders, which has served as a basis for all subsequent work to the east of the Rocky mountains. The description of the organic remains of the state by Prof. James Hall is still incomplete, but five large quarto volumes have been published. The surveys of Michigan in 1837-'46 by Houghton, and of the Lake Superior region in 1847-'9 by Jackson, and subsequently by J. D. Whitney and J. W. Foster, served to extend our knowledge of the palæozoic rocks to the westward. From that time to the present systematic surveys of the various states of the great Mississippi valley have been or still are in progress, and have already given us a pretty accurate knowledge of the geology of the whole of this vast region. The history of this work is too long for the present occasion, and it may seem invidious to mention names among workers in this great field; but a prominent place should be given, in addition to those just mentioned, to D. D. Owen, B. F. Shumard, Swallow, J. T. Hodge, Worthen, Newberry, Safford, E. W. Hilgard, Cox, and Tuomey. Nor should the important labors of Oscar Lieber in South Carolina and of Emmons in North Carolina be forgotten,

nor the elaborate survey of Virginia by William B. Rogers, of which only partial reports have been published. The geology of the western portion of our continent presents characters widely different from that already noticed, and is now attracting great attention. Much important information was gathered by the labors of W. P. Blake and J. S. Newberry in the course of the great railroad surveys undertaken by the national government; and the geological work has been continued in the important survey of the 40th parallel under Clarence King, and that of the Rocky mountain region by J. V. Hayden. These labors are still in progress, as is also a geological survey of California under J. D. Whitney, and the great geological features of this region are being rapidly made known. Much progress has also been made in the study of the geology of British North America. A geological survey of Canada, embracing the present provinces of Ontario and Quebec, was begun in 1842 under Sir W. E. Logan, with whom were associated for many years Mr. Alexander Murray and Dr. T. Sterry Hunt. In 1870 Mr. A. R. C. Selwyn succeeded Logan in the present Dominion of Canada, including the British territory west to the Pacific, the field of the survey being thus greatly extended. The provinces of Nova Scotia and New Brunswick were early examined by Gesner, since which time Matthew Bailey, Hartt, Hind, Hunt, and Dawson have done much to develop their geology. The last named has especially studied the carboniferous rocks of that region. A survey of Newfoundland is in progress under Alexander Murray. The labors of the late Sir John Richardson, Hector, Hind, and others, have done much to elucidate the structure of the great region north of Canada, until lately known as the Hudson Bay territory.—With this brief sketch of the progress of geological research in North America, we may now proceed to discuss the general principles of geological classification, and to illustrate them by especial reference to American geology. The great groups introduced by Werner remain essentially unchanged, but many alterations in nomenclature and various subdivisions and reclassifications have since been adopted, some of which require notice. Besides the great distinction between crystalline and uncrystalline rocks is that of stratified and unstratified rocks, having reference not to their intimate structure, but to their geognostical relations. The stratified rocks include all those which appear to be arranged in beds or strata, whether crystalline or not; and the unstratified, those which, like granites, traps, basalts, and volcanic lavas, occur in masses which are destitute of such arrangement, and appear to have been forced into their present position while in a more or less softened or molten condition. These are often spoken of as eruptive, irruptive, or intrusive rocks. They are with a few exceptions crystalline, and in certain cases are not readily

distinguished from those crystalline stratified rocks in which the bedding is ill defined, either from having been obscure from the first or else obliterated by subsequent crystallization. There are strong reasons for believing that the stratified crystalline rocks, by a process of softening and subsequent displacement or eruption, gave rise to the unstratified rocks with which they are often mineralogically identical; and hence the names of indigenous and exotic crystallines have been proposed by Dr. Hunt to designate respectively the stratified and the eruptive rocks. A third class of crystalline rocks is also to be distinguished, viz.: those which occur as veinstones in the fissures of other rocks, and have probably been deposited from watery solutions. Such are the quartz and spars which form the gangue of many metallic ores, and a large part of the so-called granite veins. The rocks of this third class, from their mode of formation, are designated by Dr. Hunt as endogenous crystallines. It is in some cases impossible to determine from its mineralogical characters to which of these three classes a given crystalline rock belongs. The unstratified crystalline or eruptive rocks include the modern volcanic lavas, which are evidently the products of igneous fusion, and the whole class is therefore sometimes designated as igneous rocks. It is supposed however that many of these rocks, as for example the exotic granites, have never been in a state of igneous fusion, but have assumed a plastic condition by the intervention of water under great pressure and at a temperature far below that of fused lavas. They have hence been called by some geologists plutonic and by others hypogene rocks, the latter name signifying rocks generated beneath, in allusion to their obvious subterranean source. The distinctly stratified and sedimentary character of the great formations of crystalline rocks, and the obvious analogies which they present in this respect to the uncrystalline formations, early attracted the attention of geologists. In both occur intercalated layers of limestones, argillites, and conglomerates; and the question naturally arose as to the origin of the gneisses, mica schists, diorites, serpentines, chlorite schists, and talc schists, which are the characteristic rocks of these crystalline stratified formations. That the elements of these had in some way been deposited from water, like the beds of sand, mud, and carbonate of lime of uncrystalline strata, seemed obvious; and hence the conclusion that they were once, like the latter, uncrystalline strata, which had subsequently changed their form. In accordance with this notion, they were designated metamorphic strata, and this term is by many geologists used as synonymous with stratified crystalline rocks. It was noticed that in some instances uncrystalline sediments had assumed a crystalline character in the immediate vicinity of certain erupted rocks; the effect of heat, or more probably of the heated solutions impregnating the last, having generated

in the midst of the contiguous sediments crystalline mineral species. It was then possible that a formation uncrystalline in one part of its distribution should elsewhere become crystalline, or in other words metamorphic; and it was conjectured that great areas of such rocks might be the stratigraphical equivalents of formations which are elsewhere uncrystalline sediments. In the Alps, for example, it was supposed that the gneisses and other crystalline schists were of mesozoic and even of cenozoic age, and similar rocks in other regions were declared to be palæozoic; till at length it seemed, such was the extension of the doctrine of rock metamorphism, that the sediments of any age might assume the characters of the primitive crystalline schists. In fact, the crystalline schists of the Alps, the British islands, and the Appalachians have all in turn been claimed as altered strata of palæozoic or more recent times. But these views have been controverted, and it has been shown that the crystalline strata which are now found in the Alps, superposed upon the uncrystalline fossiliferous sediments, are really ancient strata which were crystalline before the deposition of the latter, and in their normal position underlie them, but by great foldings and inversions have been brought to overlie them. In some instances in this region beds of apparently crystalline rocks are met with in which occur fossils like those of the uncrystalline sediments. These were regarded as further evidences of the metamorphic process which had proceeded so far as to develop a crystalline structure in the newer beds, without however obliterating their organic remains. But it has been shown that these pseudo-crystalline rocks are really sediments of the newer periods, made up of the ruins of the older and truly crystalline rocks. In many other cases, as in Wales and in eastern North America, it is found that the broken-up materials of the crystalline schists enter into the composition of the oldest palæozoic schists, which are themselves uncrystalline. While, therefore, it is clear that the crystalline schists were deposited from water, and, as will subsequently be seen, under conditions which, although chemically somewhat different from those of later times, did not prevent the development of organic life, it is now affirmed by one school of geologists that the great bodies of crystalline schists do not result from the alteration of any known series of uncrystalline strata; so that the division between the two established by Werner may still be retained as a fundamental one. This view is now sustained by Favre of Geneva, Sterry Hunt, Gümbel, Credner, and others; but the opposite view, which maintains a wide-spread metamorphism of palæozoic and more recent rocks, has been taught by very eminent names, and is still maintained in the principal geological text books and treatises. The partisans of the latter view, while asserting the comparatively recent origin of many crystalline schists, have always

admitted the existence of an underlying or basal system of stratified crystalline rocks, which were supposed to be anterior in their formation to the appearance of life upon the earth, and from the apparent absence of fossils were called azoic rocks (signifying without life). In accordance with this nomenclature, the formations containing the fossil remains of plants and animals have been divided into palæozoic, mesozoic, and cenozoic rocks (signifying ancient, middle, and recent life); while subsequent discoveries, indicating that life had already made its appearance in the so-called azoic period, have led to the substitution of the name eozoic (signifying the dawn of life). These four great divisions are made the basis of the

accompanying tabular view of geological formations. The subordinate divisions of Cambrian, Silurian, Devonian, &c., are of local origin, which, as will be seen, is also true of the names of most of the formations into which these in their turn are divided. In regard to the palæozoic rocks, which have been most minutely studied in Great Britain and America, the names of the subdivisions recognized in these countries are given side by side. For the details of the mesozoic and cenozoic rocks, which have been made the subject of not less careful analysis and subdivision in Europe, the reader is referred elsewhere. A complete table of them is given on page 109 of Lyell's "Student's Elements of Geology" (1871).

		BRITISH SUBDIVISIONS.	AMERICAN SUBDIVISIONS, WITH REMARKS.
CENOZOIC, OR TERTIARY.		Recent	Alluvial deposits, peat bogs, &c.
		Post-pliocene	Unstratified glacial drift, modified drift, &c.
MESOZOIC OR SECONDARY.		Pliocene	Widely distributed along the eastern and southern coasts from Massachusetts to Texas, and from Nebraska across the continent to the Pacific.
		Miocene	
		Eocene	
MESOZOIC OR SECONDARY.	CRETACEOUS.	Upper cretaceous	Occurs in New Jersey, Georgia, Mississippi, Arkansas, &c., and from Texas and the upper Missouri in many localities westward to the Pacific.
		Lower cretaceous or Neocomian	
	JURASSIC.	Upper, middle, and lower oolite	Widely developed in the western states in various localities from Dakota and Kansas to the Pacific.
		Lias	
PALÆOZOIC OR PRIMARY FOSSILIFEROUS.	TRIASSIC.	Upper, middle, and lower trias	Red sandstones of the Connecticut valley, New Jersey, Pennsylvania, the coal fields of Richmond, Va., and Chatham, N. C.
	PERMIAN.	Magnesian limestone	Permian Known in Illinois, Iowa, and Kansas.
	CARBONIFEROUS.	Coal measures	Coal measures
PALÆOZOIC OR PRIMARY FOSSILIFEROUS.		Millstone grit	To this horizon belong the coal formations of New Brunswick, Rhode Island, Michigan, Illinois, and the great Appalachian coal field.
		Carboniferous limestone	
	DEVONIAN.	Upper, middle, and lower Devonian	Catakill. Portage and Chemung..... } The Erie division of the New York series. Hence Dawson uses Erian as synonymous with Devonian. Upper Helderberg..... } Schoharie and Canda-galli. }
PALÆOZOIC OR PRIMARY FOSSILIFEROUS.	SILURIAN (Sedgwick).	Upper and lower Ludlow. }	The upper Silurian of Murchison, the third fauna of Barranda. The stratigraphical and palæontological break at the top of the Water-lime makes two great divisions of the American Silurian.
		Wenlock	
		Llandovery or May Hill .. }	
PALÆOZOIC OR PRIMARY FOSSILIFEROUS.	CAMBRIAN (Sedgwick).	Caradoc or Bals	The lower Silurian of Murchison, or the second fauna of Barranda.
		Llandello	
		Tremadoc	
PALÆOZOIC OR PRIMARY FOSSILIFEROUS.		Lingula flags	These include the primordial Silurian and the Cambrian of Murchison, the primal and aural of Rogers, the Taconic of Emmons and the Quebec group of Logan, and correspond to the first fauna or primordial zone of Barranda.
		Menevian	
		Harlech	
PALÆOZOIC OR PRIMARY FOSSILIFEROUS.		Llanberria	These include the primordial Silurian and the Cambrian of Murchison, the primal and aural of Rogers, the Taconic of Emmons and the Quebec group of Logan, and correspond to the first fauna or primordial zone of Barranda.
	 ?	
	 ?	
PALÆOZOIC OR PRIMARY FOSSILIFEROUS.		Primitive crystalline schists (Urechisfer)	Above the Laurentian, and probably in the order here given. Dana uses the name Archaean as synonymous with Eozoic.
		Huronian or Green Mt.	
		Laurentian	

It should, however, be borne in mind that all artificial. From the mode in which sediments such divisions of the rocks are arbitrary and have been deposited, and from the alternations

of sea and land, it follows that there are breaks in the succession of the rocks, which are often marked by a want of conformity in the arrangement of the successive formations. The sea retires from an uplifted continent, the strata become more or less disturbed, and perhaps in the course of ages partially broken down and swept away. When a new movement of the earth's crust brings this region once more beneath the sea, a new series of beds resting horizontally upon the older formation is deposited, and we have evidence, both from the relations of the strata and from the changes in the organic remains, of a break in the succession. Yet it is clear that elsewhere in the region occupied by the sea during this interval would be deposited sediments which fill up the interval. The process of deposition of sediments in the sea has never been interrupted, though the area of deposition has changed, and all breaks in the succession are local and accidental interruptions. Our divisions into systems and groups have been based in great part upon these interruptions, corresponding to omitted leaves in the succession, which the progress of investigation is now gradually supplying, so that the record when completed will show no breaks and no interruption either in the deposition of strata or in the succession of the forms of life. The disturbances or cataclysms which in the theories of the older school of geologists were looked upon as universal are really local, and are dependent upon the disturbances due to slow movements and the transfer of the process of sedimentation to other regions. But it is precisely where these breaks have been noticed that geologists have established horizons or lines of demarcation upon which the systems of classification have been built. From time to time we find out the formations which in other regions correspond to these interruptions, and serve to show the transition from one of the periods to another. These limits between hitherto separated formations are designated beds of passage. It is proposed to give a brief sketch of the successive geological groups enumerated in the preceding table, commencing with the lowest or eozoic period, and to notice the principal facts in their history, more especially as seen in North America.—The rocks which we have called eozoic include the crystalline strata, which are regarded in the present state of our knowledge as forming four great groups marked by lithological differences. At the base we have placed the Laurentian, which consists in great part of granitoid gneiss, in which, but for the interposed strata of quartzite, crystalline limestone, &c., there would in many parts be found small evidence of its stratified origin. This ancient group is what is called in Scandinavia the primitive gneiss, and corresponds to the fundamental granite which is often spoken of as underlying all other rocks. It is the oldest series of rocks known, and in North America forms a large part of the Lau-

rentides, the Adirondacks, the Highlands of the Hudson, and their continuation southward. The thickness of this great series is unknown, but Sir William Logan has estimated that at least 20,000 ft. of strata belonging to it are exposed on the Ottawa river. It there includes three great limestone formations, which are associated with iron ore, plumbago, and phosphate of lime, and contain the remains of a foraminiferous organism to which Dawson has given the name of *eoazon Canadense*. To the Laurentian succeeds what has been named the Huronian, a group of crystalline rocks much more schistose than the Laurentian, and consisting of imperfect gneisses, with micaceous, chloritic, and talcose schists, and beds of hornblende and serpentine rocks, associated with argillites and magnesian limestones. This series is widely spread along both the N. and S. shores of Lake Superior, and the N. shore of Lake Huron, and constitutes the Green mountain range of eastern Canada and New England, stretching thence northeastward into Newfoundland and southwestward along the Appalachians. Rocks apparently belonging to this series fringe portions of the E. coast of New England, and are seen in a wider development in the coast range of southern New Brunswick. In some parts of the Lake Superior region the Huronian rocks are found to rest unconformably upon the Laurentian, and to be made up in part of its ruins, thus indicating a break between the two series. The third great group noticed in our table is that of the White mountains, or, as it may be called, the Montalban series. It consists in great part of gneisses, which, however, are lithologically dissimilar from those of the Laurentian, and are associated with large bodies of highly micaceous schists, abounding in kyanite, staurolite, andalusite, and garnet. This series of rocks is traced from the White mountains northeastward across the state of Maine and southwestward throughout the Appalachians. The facts, so far as known, seem to show that it is newer than the Huronian, resting unconformably upon it, and in some places probably upon the Laurentian in the absence of the former. The fourth group is what has been called the Norian or Labradorian, which consists in great part of granitoid or gneissoid varieties of the rock called norite, consisting chiefly of Labrador feldspar. With this are associated gneisses, quartzites, and crystalline limestones not unlike those of the Laurentian. This series in various parts of Canada and in northern New York appears to rest unconformably on the Laurentian, and was hence called by Sir William Logan the upper Laurentian; but according to recent observations by Hitchcock, it occurs in New Hampshire, apparently overlying the White mountain series. Dr. Sterry Hunt, who is the author of this attempt to group and classify the eozoic rocks, remarks: "The distribution of the crystalline rocks of the Norian, Huronian, and

Montalban series suggests that they are remaining fragments of great formations once widely spread over an ancient floor of granitic (Laurentian) gneiss; but that these four series mentioned include the whole of the stratified crystalline rocks of North America is by no means certain. How many more formations may have been laid down over this region and subsequently swept away, leaving only isolated fragments, we may never know; but it is probable that a careful study may establish the existence of many besides the four series above enumerated." Notwithstanding the distinction which has been drawn between crystalline and uncrystalline rocks, there is probably to be found somewhere a series of beds marking the passage from these crystalline schists to the uncrystalline sediments of the palæozoic, although, so far as yet studied, the oldest known strata hitherto referred to the latter are completely uncrystalline, and rest unconformably upon crystalline eozoic rocks. There appears to be a close similarity between the latter in widely separated countries, the great series already indicated being recognized with their typical characters in remote parts of the globe.—The palæozoic rocks have been divided into five great groups, sometimes called systems; but these divisions, as already remarked, are local, and the breaks in stratification and in the succession of organic remains are in some parts filled by beds of passage. As will be seen in the table, there is some difference in the nomenclature of the lower palæozoic rocks, a portion of the Cambrian of Sedgwick being included by Murchison in the Silurian. In the present account we shall use these terms in the sense in which they were applied by the former. The lower portions of the palæozoic show no evidence of terrestrial forms of life, their vegetable remains consisting of algae, and their animals of mollusks, corals, and crustaceans. At the summit of the Silurian, however, fishes and amphibians appear, while an abundant land vegetation of acrogens and gymnosperms begins to make its appearance. The palæozoic rocks are of especial interest to the student of American geology, as they form the surface of the greater portion of the United States east of the Rocky mountains. The succession of the members of the palæozoic series in this country was first clearly defined by the geological survey of New York, which in its reports in 1842 included under the name of the New York system the whole of the known palæozoic rocks to the base of the coal formation. The subdivisions then established have since been generally adopted in the United States, and their relations to those recognized in Great Britain will be seen in the table. The names Cambrian, Silurian, and Devonian found their way into American nomenclature some years later. For an account of the progress of discovery in these rocks, the reader is referred to the third part of a paper on "The History of Cambrian and Silurian," by Dr. Hunt, in the "Canadian Nat-

uralist" for July, 1872. The lower and middle Cambrian is represented in the New York series by the Potsdam sandstone, and the calciferous sand rock, having a combined thickness of less than 1,000 ft. To the eastward along the confines of New England, and thence north-eastward along the base of the Green mountain range, however, a series of 10,000 ft. or more of sandstones, argillites, and limestones (including the Levis formation), is regarded as the representative of the lower and middle Cambrian, and has received the names of the Taconic system and the Quebec group. Still further east, along the E. coast, in Massachusetts, New Brunswick, and Newfoundland, are found strata of lower Cambrian age, referred to the Menavian of Great Britain. Between the middle and the upper Cambrian in New York is a break marked by a change in the fauna, and in some localities by a want of conformity between the strata. The Chazy limestone, which in some places is wanting, shows the passage between the two. The upper Cambrian is represented by the limestones of the Trenton group, followed by the Utica slates and the shales and sandstones of the Hudson river group; the last three divisions being known in Ohio as the Cincinnati group. Succeeding this occurs the Oneida conglomerate, followed by the Medina sandstone rocks, which are in part derived from the ruins of the underlying formations, and which mark a period of disturbance and a break in the succession. They are succeeded by the Clinton, Niagara, and Onondaga formations. The latter, sometimes known as the Salina formation, is characterized by beds of rock salt and of gypsum, and is succeeded by the water-lime beds, which, as well as the other strata of this division, from the Medina sandstone upward, consist chiefly of dolomite or magnesian limestone. This upper part of the American Silurian represents the deposits in a basin separated from the open ocean, and depositing by its gradual evaporation strata of salt and gypsum, the strata associated with which are almost destitute of organic remains. They attain a considerable thickness in Ontario and in central New York, but thin out to the eastward and disappear before reaching the Hudson river. To this division succeed the lower Helderberg limestones, characterized by an abundant fauna, and marking by their distribution a change in the geographical conditions of the region, by which a deposit of marine limestone was spread alike over all the preëxisting rocks, to the eastward, resting unconformably upon the Cambrian and the eozoic rocks, and attaining in eastern Canada a thickness of 2,000 ft. or more, where it is overlaid by a great series of sandstones, representing the Oriskany and the subsequent Devonian. This, in the New York series, is marked by but a small amount of sandstones, followed by the corniferous limestone and the Hamilton group, which together make up the upper Helderberg, and are succeeded by a series of sandstones, the whole

constituting the Erie division of the New York series, the equivalent of the English Devonian or old red sandstone, and characterized by an abundant terrestrial fauna, the precursor of that of the carboniferous series, into which it passes by such transitions that it is a matter of discussion where to draw the line. The carboniferous series is so named because it is the earliest and most important coal-bearing series of strata, and includes great beds of fossil fuel, interstratified with sandstones and shales. At the base of the carboniferous in Michigan, Pennsylvania, and western Virginia, and also in Nova Scotia and New Brunswick, deposits of gypsum and salt are met with. In the western part of its distribution, toward the Mississippi, the carboniferous formation includes great thicknesses of marine limestone, which are wanting in the east. Overlying the carboniferous in Kansas and Iowa are beds which are the equivalent of the magnesian limestones of the north of England, and of the rocks called Permian in Russia. They are regarded as the summit of the palæozoic series.—The palæozoic rocks correspond to the transition rocks of Werner, to the lower part of which the name of the graywacke series was very generally given until the labors of Sedgwick and Murchison classified them and established the great divisions of Cambrian, Silurian, and Devonian. The thickness of these groups varies greatly in different parts of their distribution. Thus, while the entire palæozoic series in Pennsylvania is estimated at 40,000 ft., it is reduced to 4,000 in the valley of the Mississippi. This is due to the fact that the great sandstones, apparently derived from the erosion of rocks to the eastward, thin out in the opposite direction. In a similar manner the Cambrian and Silurian rocks, which attain in Great Britain a thickness of 80,000 ft., are represented by less than 2,000 ft. in Scandinavia.—Under the name of mesozoic or secondary rocks are included the triassic, Jurassic, and cretaceous series. The former has received its name from the threefold division of it in Europe into sandstones, overlaid by fossiliferous limestones, which are succeeded by sandstones and shales. At the base of the trias in the Tyrol, at St. Cassian and Haltstadt, occurs a series of fossiliferous beds in which the characteristic animal remains of the trias are found mingled with those of the palæozoic, thus showing a passage between the palæozoic and the mesozoic rocks. The trias, both in England and on the continent of Europe, is characterized by beds of rock salt and gypsum, like the Silurian and the lower carboniferous in North America. The sandstones of the trias in England are often red, and constitute what is there named the new red sandstone. The same name is applied to sandstones of similar age which are found in Prince Edward island and Nova Scotia, in the valley of the Connecticut, and in New Jersey, Pennsylvania, Virginia, and North Carolina. To this series belong the coal fields of Rich-

mond, Va., and Chatham, N. C. It is not improbable that these beds may include strata belonging to the subsequent or Jurassic period, so named because it is greatly developed in the Jura mountains. This includes both the lias and the oolite of England, which two on the continent are connected by beds of passage known as the Koesen or Rhætic strata. The oolite of England consists of highly fossiliferous strata, chiefly marine, but in part fresh-water deposits, and through the Neocomian (Neufchâtel) beds passes into the cretaceous or chalk formation, the upper part of which is characterized in northern Europe by that pure uncrytalline limestone known as the chalk, a deep-sea deposit many hundred feet in thickness, made up almost entirely of the remains of minute animal organisms.—The rocks of the cenozoic or tertiary period are closely connected with the present time, and even in their lower portions contain some species of fossil shells identical with those now living. Lyell has conveniently divided the tertiary, in ascending order, into eocene, miocene, and pliocene; to these are added a postpliocene division which includes the period of glacial drift. (See DILUVIUM.) The tertiary rocks attained a great thickness in some parts of their distribution. Thus in the Alps the miocene sandstones and conglomerates, known as the molasse, have in parts a thickness of more than 6,000 ft., while the nummulitic limestone, a subdivision belonging to the base of the tertiary, attains in the Mediterranean basin a thickness of more than 2,000 ft.—We have already spoken of the trias of the eastern part of North America. The cretaceous is also represented in New Jersey and along the southern border of the palæozoic from Georgia to Tennessee. Triassic, Jurassic, and cretaceous rocks are also widely spread between the Mississippi and the Rocky mountains, from Texas to Dakota, and westward over large areas to the Pacific coast. Deposits like the English chalk are unknown in this formation in North America. Tertiary rocks of various ages skirt the Atlantic coast from the Rio Grande to New Jersey, and are even met with off the coast of Massachusetts. They stretch from the gulf of Mexico to Kentucky, and like the mesozoic rocks occupy large areas to the westward, where on the Pacific coast they attain great thickness.—The succession of organic life in these various groups constitutes a study by itself, which will be considered under the head of PALÆONTOLOGY. The palæozoic age is preëminently the period of mollusks, corals, and crustaceans, the most important class of which last in the early times were the trilobites, which appear in their greatest development in the Cambrian and Silurian, and die out in the carboniferous. Fishes, the earliest representatives of vertebrate life, make their appearance near the summit of the Silurian, and abound in the upper palæozoic; reptiles first appear in the carboniferous, and reach their greatest development in the mesozoic, in which rep-

tilian forms of immense dimensions, and having curious resemblances to birds, are met with; while the birds themselves, which then first appeared, had remarkable reptilian affinities. The earliest evidences of mammals appear in the trias; throughout the mesozoic they were insignificant in size, and chiefly marsupial. In the eocene and miocene divisions of the tertiary we find the greatest development of mammalian forms. The deposits of these strata to the west of the Mississippi have within the last few years afforded a great number of remarkable species of mammals, which have been described by Leidy, Marsh, and Cope. The flora of the tertiary period is not less remarkable than its fauna. The geographical and climatic conditions of the northern hemisphere were then widely different from those of the present day. Not only over Europe, but in North America, and northward as far as Greenland and Spitzbergen, a mild and equable climate prevailed, and the abundant plant remains preserved in the tertiary beds of those arctic regions show a luxuriant vegetation like that of the warmer parts of the temperate zone of to-day. This condition of things had been of long continuance; for in western America great beds of coal or lignite are found both in the cretaceous and the eocene strata. It was continued far into the pliocene; but as this went on, a cold climate like that which now characterizes the northern hemisphere prevailed, and gave rise to the glacial phenomena which have been described under the head of DILUVIUM. This change of climate is one of the most perplexing problems of geology. That a different distribution of land and water and of the oceanic currents may have contributed in some degree to this former climatic condition of the arctic regions is probable. Astronomical conditions connected with changes in the eccentricity of the earth's orbit have also been suggested as a cause; and finally it has been supposed that a somewhat different chemical composition of the earth's atmosphere prevailing up to that time may have coöperated with geographical conditions to maintain the peculiarly mild climate which, so far as we can judge, prevailed throughout the arctic regions in palæozoic times, and perhaps without interruption nearly to the close of the tertiary.—The distribution of metallic ores and other economic materials in the various geological series is a point of much interest, and demands a brief notice in this place, although the subject is discussed more in detail under MINERAL VEINS, and in the articles on the different metals. Metallic ores are met with both in beds interstratified with the rocky layers and in veins cutting these. The eozoic rocks are remarkable for their great deposits of crystalline iron ores, of which those of the Laurentian on Lake Champlain and those of the Huronian on Lake Superior are remarkable examples, as are also those of Missouri. Similar deposits occur in the eozoic

rocks of Scandinavia and Russia. It is in these rocks also that titanite and chromic iron and emery occur; and to them belong graphite and beds of iron pyrites and copper pyrites, often associated with gold and with silver. Oxide of tin also appears to be characteristic of these crystalline rocks. These various ores are found not only in contemporaneous layers, but also in veins and beds cutting the crystalline strata. But the metallic ores are not confined to these more ancient rocks, for beds of oxide and carbonate of iron are met with at various horizons from the Cambrian up to recent times, while under the heads of COPPER and GOLD the distribution of those metals and their ores is described. Besides these contemporaneous deposits, veins or lodes carrying the ores of various metals are found cutting rocks of all ages, and are probably even now in process of formation.—The question of eruptive or exotic rocks has already been briefly alluded to, but from its intimate connection with volcanic phenomena, from which it cannot well be separated, it is proposed to consider the whole subject in the article VOLCANO, in which connection the various theories with regard to the nature of the earth's interior, the sources of subterranean heat and of ancient and modern eruptive rocks, as well as of the gaseous products of volcanic eruptions, will be discussed. (See also GRANITE.) Under the head of MOUNTAIN will be considered some of the most important questions of geological dynamics, namely, those relating to the elevation of continents, the phenomena of denudation, and the origin of mountains. The chemical history of the globe, or what may be called chemical geology, will be discussed under the titles ROCKS and WATER.

GEOMETRY (Gr. *γεωμετρία*, from *γῆ*, the earth, and *μετρέω*, to measure), the science of relations in space. As its name indicates, it originally denoted the measurement of land, and was equivalent to what is known in modern times as surveying. As at present understood, surveying is but a subordinate application of the science, and although geometry retains its ancient name, it has by the labors of many successive generations grown to be a vast and comprehensive system, forming the basis of many of the most important arts and sciences. It has been defined as "the science which treats of forms in space;" and if we give a sufficiently extended meaning to the word "form," the definition is perhaps as good as any other. It regards material objects only in so far as they occupy space. With their other physical qualities, their color, weight, hardness, &c., geometry has nothing to do. Assuming that a billiard ball and the sun are each a perfect sphere, then the only geometrical difference between them is the difference in size. Neither has geometry anything to do with the nature of space abstractly considered. It assumes the notion of space as it is assumed by all men in practical life, and leaves to philosophy

the discussion of its nature. It assumes that space is infinite in extent; that is, it assumes as undeniable, and therefore as requiring no proof, that we can neither in fact nor in thought set any boundary to space and rightfully say there is no space beyond. It assumes that space is infinitely divisible; that is, that no portion of space is so small that we cannot conceive it as being divided. Finally, it assumes that space is continuous; that is, that which separates any two definite portions of space is itself space. Any definite portion of space, whether occupied by a body or not, is in geometry called a solid or volume, and the property of a body by virtue of which it occupies space is called extension. Extension is said to have three dimensions, length, breadth, and thickness. The limits of a solid are called surfaces, and are said to have length and breadth without thickness. The limits of a surface are called lines, and are said to have length without breadth or thickness. The limits of a line are called points, and are said to have neither length, breadth, nor thickness, but position only. A point may be considered independently of any line, a line independently of any surface, and a surface independently of any solid. The definitions of these fundamental notions of geometry have always been matters of controversy among geometers and philosophers, but practically all men are agreed as to its nature. The idea of space involves three notions which are indissolubly connected, viz.: position, direction, and magnitude. Starting from any given point, we can suppose lines to be drawn in an infinity of different directions. The difference in the direction of any two of these lines is called an angle. A line whose direction is everywhere the same is called a straight or right line; a line which changes its direction at every point is called a curved line. When the word line is used alone, and there is nothing to indicate the contrary, a straight line is always meant, and a curved line is usually called simply a curve. In treating of forms in space, straight lines, angles, and curves, and their mutual relations, are the principal things which the geometer has to consider. The object of geometry is the indirect measure of magnitude. To measure a magnitude is to find how many times it contains a known magnitude of like nature with itself, which is assumed as a unit. Thus, to measure a line is to find how many times it contains a line of known length, as an inch, a foot, a yard, a metre; to measure a surface is to find how many times it contains a known surface, as a square inch, a square foot, a square yard, a square metre, an acre, a square mile; to measure a solid is to find how many times it contains a known solid or volume, as a cubic inch, a cubic foot, a cubic yard, a cubic metre, a cubic mile. To measure a straight line, the most obvious method is to apply to it the assumed unit, for example, a foot, and count the number of times the line to be measured

contains it. This method of measurement is purely mechanical, and geometry has nothing to do with it; it is a question, not of geometry, but of physics and arithmetic. In many cases, as in measuring the height of a mountain, this method is impracticable; in many others, as the distance of the moon from the earth, it is impossible. And when we pass from the measurement of straight lines to the measurement of curves, surfaces, and solids, we find that in almost all cases the mechanical method is either impracticable or impossible. Thus the every-day problem, to find how many acres there are in a farm, would, in the absence of all geometrical knowledge, remain for ever insoluble. It is evidently necessary to find some method of measuring indirectly that which we cannot measure directly. Thus in the case of a farm we can measure by mechanical means the length and directions of its boundary lines, and then geometry teaches how, knowing these, we can find the number of acres it contains. Let us take as another example a problem of a higher kind. From the observation of certain physical facts men long ago concluded that the earth was a spherical body. A great number of interesting questions immediately presented themselves. What was its diameter? How many square miles did its surface contain? Were all its diameters equal? To answer these questions by direct measurement was impossible; all that could be done was to measure here and there a line upon its surface. Yet with the aid of a few direct measurements and of the principles of geometry all these questions have been answered. It is evident that the attainment of these results would be hopeless, and that geometry would be impossible, unless the different magnitudes of space and the elements of which each magnitude is composed were related to each other according to certain fixed and definite laws. The number of different forms in space is infinite, and unless their relations to each other were fixed and definite, and they were susceptible of classification and comparison, there could be no science of geometry. The same would be the case if the different magnitudes which are the elements of every form were not connected by definite relations. Geometry shows that they are so related, and explains the nature of those relations.—According to the different points of view from which it is regarded, geometry is variously divided. Its primary division is into elementary and higher geometry. Elementary geometry treats of angles, straight lines, planes bounded by straight lines, solids bounded by planes, circles, cylinders, cones, and spheres. The treatment of all curves except the circle, and of all surfaces and solids which involve the consideration of any curve other than the circle, belongs to higher geometry. The only instruments necessary for the construction of the figures employed in treating of elementary geometry are the rule and

compasses. If the solution of a problem requires in its graphic representation a line which cannot be drawn by means of these two instruments, it was not considered by the ancient Greek geometers a geometrical solution. Elementary geometry is sometimes subdivided into planimetry and stereometry, the former treating only of such lines and figures as lie in a plane, the latter of solids bounded by planes, and of the sphere, cone, and cylinder, which are usually designated as the three round bodies. That part of planimetry which treats of the measurement of triangles, and shows how, the magnitude of certain parts of a triangle being given, the magnitude of the other parts can be found, is called trigonometry, and, on account of the peculiarity of the methods which it employs, is usually treated as a separate branch of geometry. Geometry again is divided into synthetic and analytic, or ancient and modern, or special and general; divisions which all signify the same thing, and are based upon the difference between the methods which are employed in them respectively. Synthetic, ancient, or special geometry is founded upon the direct observation of the forms or figures themselves, and all its reasonings are conducted with direct reference to those figures. Thus, in treating the ellipse, the first thing to be done, according to this method, is to draw an ellipse upon a plane, or to draw a representation of a cone with a plane passing through it obliquely to its axis, or in any other convenient way to bring before the mind the actual figure; next, to draw such other lines as the course of the reasoning may require; and lastly, to demonstrate, in accordance with the rules of logic and previously established propositions, the different proportions of the figure. This method, when compared with the analytic, modern, or general method, of which we shall presently speak, possesses great advantages and disadvantages. Among the former we mention that it is evidently the natural method, that is, the method to which the human mind naturally would and must resort in its first attempts to investigate the relations of space. It keeps not only before the mind but before the eyes the actual thing whose nature we are investigating, and constantly calls upon the hands to do what the mind has conceived. As a mental discipline, geometry studied in this manner is not surpassed, perhaps not equalled, by any other science. Especially in the solution of problems reason, ingenuity, and imagination are all called into exercise. This method was the only one known to the ancient Greeks, and they regarded geometry as holding the highest rank among the sciences. Plato is said to have inscribed over his door, "Let no one enter here who is unacquainted with geometry." The analytic or modern method is, as to its form, characterized by the application of the processes of algebra and the calculus to the discussion of the relations of space. But its

true nature consists in its generality. The ancient geometry was essentially special. Thus the study of one curve was of little or no advantage in the study of another, except in so far as it had trained and strengthened the mental powers. The problem to draw a tangent to any point of a curve affords striking example of the difference between the two methods. When the ancient geometer had discovered a method of drawing a tangent to any point of the circle or the ellipse, this did not aid him in drawing a tangent to the curves called the conchoid and the cissoid. Whenever a new curve was discovered, the problem of drawing a tangent to it had to be solved anew, and independently of its solution in the case of any other curve. Modern geometry substitutes, in place of the consideration of the geometrical magnitudes themselves, the consideration of equations representing them according to a general system; and after the discovery of the differential calculus the problem above mentioned was solved with the greatest ease and simplicity by a formula applicable to every known curve and to every curve that may hereafter be discovered or invented. (See ANALYTICAL GEOMETRY.) Considered as a method of arriving at results, the modern is infinitely superior to the ancient; considered as a means of mental discipline, its superiority is disputable.—The history of geometry may be conveniently divided into five periods. The first extends from the origin of the science to about A. D. 550, followed by a period of about 1,000 years during which it made no advance, and in Europe was enshrouded in the darkness of the middle ages; the second began about 1550, with the revival of the ancient geometry; the third in the first half of the 17th century, with the invention by Descartes of analytical or modern geometry; the fourth in 1684, with the invention of the differential calculus; the fifth with the invention of descriptive geometry by Monge in 1795. The quaternions of Sir William Rowan Hamilton, the *Ausdehnungslehre* of Dr. Hermann Grassmann, and various other publications, indicate the dawn of a new period. Whether they are destined to remain merely monuments of the ingenuity and acuteness of their authors, or are to become mighty instruments in the investigation of old and the discovery of new truths, it is perhaps impossible to predict. According to a tradition handed down by the Greek historians of geometry, the science took its rise among the Egyptians. The inundations of the Nile annually obliterated their landmarks, and efforts to restore them gave rise to geometry. From them, about 600 B. C., Thales of Miletus, one of the "seven wise men" of Greece, is said to have derived a knowledge of the elements of geometry, and to have introduced it into Greece. Pythagoras is also said to have derived his first notions of geometry from the same source, and to him is ascribed the dis-

covery of the proposition, which still bears his name, that the square described on the hypotenuse of a right-angled triangle is equal to the sum of the squares described on the other two sides. His disciples are said to have demonstrated the incommensurability of the diagonal and side of a square, and to have investigated the five regular solids. They were also possibly acquainted with the transcendental definition of the circle, viz., that it is the figure which within a given perimeter contains the greatest area; and with the analogous proposition in regard to the sphere, that it is the body which within a given surface contains the greatest volume. About a century after Pythagoras, Plato and his disciples commenced a course of rapid and astonishing discoveries, through the study of the analytic method, conic sections, and geometric loci. The ancient analytic mode consisted in assuming the truth of the theorem to be proved, and then showing that this implied the truth only of those propositions which were already known to be true. In modern days the algebraic method, since it allows the introduction of unknown quantities as data for reasoning, has usurped the name of analytic. Conic sections embrace the study of the curves generated by intersecting a cone by a plane surface. Within 150 years after Plato's time this study had been pushed by Apollonius and others to a degree which has scarcely been surpassed by any subsequent geometer, and his works, embracing his predecessors' discoveries as well as his own, proved 19 centuries afterward the foundation of a new system of astronomy and mathematics. Geometrical loci are lines or surfaces defined by the fact that every point in the line or the surface fulfils one and the same condition of position. The investigation of such loci has been from Plato's day to the present one of the most fruitful of all sources of geometrical knowledge. Just before the time of Apollonius, Euclid introduced into geometry a device of reasoning which was exceedingly useful in cases where neither synthesis (i. e., direct proof) nor the analytic mode is readily applicable; it consists in assuming the contrary of your proposition to be true, and then showing that this implies the truth of what is known to be false. Contemporary with Apollonius was Archimedes (died in 212 B. C.), who introduced into geometry the fruitful idea of exhaustion. By calculating circumscribed and inscribed polygons about a curve, and increasing the number of sides until the difference between the external and internal polygons becomes exceedingly small, it is evident that the difference between the curve and either polygon will be less than that between the polygons themselves; and the process may be continued by increasing the number of sides, until the difference between the curve and the polygon is as small as we please. This method is generally regarded as the germ of the differential calculus. Hipparchus

in the 2d century before Christ, and Ptolemy in the 2d century after Christ, applied mathematics to astronomy; at the date of the latter writer the doctrine of both plane and spherical triangles had been well discussed by Theodosius and Menelaus. Vieta (1540-1603), to whom we principally owe the perfecting of algebra, enlarged Plato's analytic method by applying algebra to geometry. Kepler (1571-1630) introduced into geometry the idea of the infinitesimal, thus perfecting the Archimedean exhaustion; he also first made the important remark which leads to the solution of questions of maxima, that when a quantity is at its highest point its rise becomes zero. To Kepler we owe also one of the first examples of a problem of descriptive geometry, in the graphic solution of an eclipse of the sun. Soon after Kepler, Cavalieri published (1635) his *Geometria Indivisibilium*, a further step in the road from Archimedes's exhaustions to Newton's fluxions. Roberval gave a method of drawing tangents identical in its philosophy with fluxions. Fermat (who shares with Pascal the credit of inventing the calculus of probabilities) introduced the infinitesimal into algebraical calculation, and applied it with great success to geometrical questions. Pascal anticipated some of the latest inventions by his famous theorem concerning the relation of six points arbitrarily chosen in a conic section. But most wonderful of all the geometrical inventions of the 17th century was that of Descartes, published in 1637; it consisted simply in considering every line as the locus of a point whose position is determined by a relation between its distances from two fixed lines at right angles to each other. The relation between these distances, being expressed in algebraical language, constitutes the equation of the curve. By later geometers this method has been generalized so that the distances may be measured from any fixed point or line, and measured in a straight line or in a given curved line; or instead of some of the distances, directions or angles may be introduced. For a majority of the most important cases, however, Descartes's coördinates are still the best. Huygens, whose treatise on the pendulum is ranked by Chasles with Newton's *Principia*, making a combination of Descartes's methods with those of his predecessors, added to geometry the beautiful theory of evolutes, which are the curves formed by the intersection of straight lines at right angles to a given curve; and he applied it not only to the pendulum, but to the theory of optics. Soon after (1686) Tschirnhausen published a wider conception of the generation of curves by straight lines. His famous caustics were made by the intersection of reflected or refracted rays of light; and he proposed other curves made by a pencil point stretching a thread whose ends were fastened, and which also wrapped and unwrapped from given curves. About the same time also De la Hire and Le Poivre invented, independently of each other,

modes of transforming one plane curve into another, by making the given curve a peculiar basis for the locus of a new curve. They thus transformed the circle into all the conic sections, without any reference to a cone. The great Newton also invented a means to the same end, so that the consideration of the ellipse and parabola became independent of that of any solid. Thus these methods, especially that of Le Poivre, anticipated descriptive geometry, and perhaps prepared the way for it. In 1700 Parent generalized the method of Descartes from representing a line to representing a curve surface by an equation between the distances of a point in the surface from three given planes, at right angles to each other; but this was not methodically arranged, and it was left for Clairaut, in 1731, to finish this great step. Meanwhile Newton's fluxions and Leibnitz's differential calculus had come into use, and Newton, Maclaurin, and Cotes had made the most exhaustive investigation into curves of the third degree, and many fine discoveries in regard to curves in general. The enthusiasm which Newton's example aroused in England and Scotland for pure geometry was followed by a lull of about a century, when Monge by his "Descriptive Geometry" gave the whole study new life. The essence of descriptive geometry lies in the transmutation of figures, the reduction of geometry of three dimensions to geometry in a plane. One beautiful example of this branch of science may be found in linear perspective, which simply projects the points of a solid upon a plane, by straight lines of light from the eye. Carnot, at the beginning of this century, in his "Geometry of Position" and "Theory of Transversals," also introduced valuable methods; in the first showing how to indicate the direction of lines more exactly by the use of positive and negative signs, and how to use the idea of motion more effectively than before in geometry; in the second introducing that general form of the theory of transversals, i. e., of the intersections of a system of lines by one not belonging to the system, which Chasles employs so happily in his *Géométrie supérieure* (1852). This writer develops two principles in the correspondence of figures: one, the principle of duality, by which for a given figure a second is found such that points, planes, and straight lines in one correspond to planes, points, and lines in the other; the second, the principle of homography, by which for any figure a second is drawn such that points, planes, and lines in one correspond to points, planes, and lines in the other; the utility of each being to transfer the demonstrations of truth in one figure to the problems of another figure. We have alluded to the difficulty of appreciating the value of some of the new methods of treating geometry which have been discovered or invented in recent times, more especially the "quaternions" of Sir W. R. Hamilton and the "doctrine of extension" of Dr. H. Grassmann.

From a somewhat protracted study of both systems, the present writer is satisfied that any attempt to give a condensed account of them would only serve to perplex the reader. Especially is it difficult to comprehend either system without a more than ordinary acquaintance with the history of mathematical science during the present century, and particularly with the efforts to give a geometrical interpretation of what are called in algebra imaginary quantities.—The beginner in geometry will find many text books, of which none is more popular than the "Elements of Geometry and Trigonometry," by Prof. Charles Davies, from the works of A. M. Legendre (New York, 1858). Much more condensed and suggestive is an "Elementary Treatise on Plane and Solid Geometry," by Prof. Benjamin Peirce (Boston, 1858). An easier treatise than either of these, by Prof. G. R. Perkins, has been published in New York. The true style of Greek geometry may be found in Playfair's "Euclid." For advanced studies the following list of works is recommended: "Modern Geometry," by Mulcahy (London, 1859), giving some idea of the new methods, but not employing analytical geometry; "Elementary Treatise on Plane and Spherical Trigonometry," and "Elementary Treatise on Curves, Functions, and Forces," by Benjamin Peirce (Boston, 1858), giving in its most condensed form the necessary introductory knowledge of the notation of trigonometry, analytical geometry, and the calculus; "Analytical Geometry," by Charles Davies (New York, 1855), giving a more popular expression of the same knowledge; a "Treatise on Conic Sections, containing an Account of some of the most important Modern Algebraic and Geometric Methods," by G. Salmon (London, 1855); a "Treatise on the Higher Plane Curves," by the same author; Sir Isaac Newton's *Enumeratio Linearum Tertii Ordinis*; Sir W. R. Hamilton's "Lectures on Quaternions" (Dublin, 1853) and "Elements of Quaternions" (London, 1866); "An Elementary Treatise on Quaternions," by P. G. Tait (Oxford, 1867); Charles's *Traité de géométrie supérieure* (Paris, 1852), *Mémoire de géométrie sur les propriétés géométriques des coniques sphériques* (Brussels, 1831; soon after translated into English), and *Aperçu historique sur l'origine et le développement des méthodes en géométrie* (Brussels, 1837; translated into German, Halle, 1839; a work which will richly repay a close study); Carnot's *Géométrie de position* (Paris, 1803), *De la corrélation des figures de géométrie* (1801), and *Mémoire sur la relation qui existe entre les distances respectives de cinq points quelconques pris dans l'espace, suivi d'un essai sur la théorie des transversales* (1806, and 4to, 1815); Monge's *Géométrie descriptive* (Paris, 7th ed., 1846, including *Application de l'algèbre à la géométrie*); *Systematische Entwicklung der Abhängigkeit geometrischer Gestalten von einander, mit Berücksichtigung der Arbeiten alter und neuer*

Geometer über Porismen, projective Methoden, Geometrie der Lage, Transversalen, Dualität und Reciprocität, by Steiner (Berlin, 1832); four books of Plücker of great merit, the *Analytische geometrische Entwicklungen* (2 vols., Essen, 1828-'31), *System der analytischen Geometrie auf neue Betrachtungsweisen gegründet* (Berlin, 1833), *Theorie der algebraischen Curven, gegründet auf eine neue Behandlungsweise der analytischen Geometrie* (Bonn, 1839), and *System der Geometrie des Raumes in neuer analytischer Behandlungsweise* (2d ed., Düsseldorf, 1852); *Lehrbuch der Geometrie*, by Karl Snell (Leipzig, 1841); *Grundlinien der neueren Geometrie*, by Dr. Benjamin Witzschel (Leipzig, 1858); and *Die Ausdehnungslehre vollständig und in strenger Form bearbeitet*, by Dr. Hermann Grassmann (Berlin, 1862).

GEORGE (Lewis) I., king of Great Britain and Ireland, first sovereign of the Hanoverian line, born in Osnabrück, May 28, 1660, died near that place, June 10, 1727. He was the eldest son of the elector Ernest Augustus of Hanover and the electress Sophia, granddaughter of James I. In 1681 he went to England to pay his addresses to the princess (afterward queen) Anne; but immediately upon landing he received his father's orders not to proceed in the business, and returning home, he married in the following year his cousin Sophia Dorothea, daughter of the duke of Celle. He served in the armies of the empire against both the Turks and the French, and succeeded to the electorate in 1698. In 1700 he led a force to the aid of the duke of Holstein against the king of Denmark, and raised the siege of Tönningen. He held to the English alliance throughout the war of the Spanish succession, and in 1707-'9 commanded the imperial forces against the French; but he did not approve the treaty of Utrecht in 1713, standing out with the emperor till the peace of Rastadt in 1714. By acts of convention and parliament of 1689 and 1701 the succession of the English crown had been fixed as follows: James II. and his son being excluded, the next heirs were: 1, the princess Mary of Orange, eldest daughter of James II.; 2, the princess Anne of Denmark, his younger daughter; 3, William of Orange, son of Mary, eldest daughter of Charles I. After the decease of Mary and William without issue, the crown should descend to the princess Anne, and on her decease without issue to the heirs of William. In the failure of such heirs the succession was further limited to the electress Sophia of Hanover, passing over nearer heirs who were Roman Catholics. By the treaty of union with Scotland in 1707 the same succession was secured for the crown of Scotland. The Hanoverian succession was guaranteed by treaty with Holland in 1706, 1709, and 1713, and by the treaty of Utrecht in 1713. The electress Sophia died May 28, 1714, and her son George Lewis became heir apparent, and succeeded Queen Anne at her death on Aug. 1 of the same year. In spite

of schemes to place upon the throne the son of James II., the accession of George I. was without disturbance. He arrived with his eldest son at Greenwich in September, and was crowned the next month. The ministers of Queen Anne, Bolingbroke, Oxford, and their associates, were impeached, and a whig ministry came into power, Viscount Townshend and Sir Robert Walpole being its most influential members. The opposition broke out into rebellion in Scotland and the north of England, but was overcome in the battle of Preston, Nov. 12-13, 1715; and although the pretender landed in Scotland in December, 1715, his presence did not strengthen his cause, and he soon fled. The leading rebels were captured, and some of them punished with severity. The dangers of this rebellion led to the repeal of the triennial act, and an act was passed allowing parliament to sit for seven years unless dissolved by the crown. On Jan. 4, 1717, a triple alliance was formed with France and Holland against Sweden and Russia. The Swedish ambassador was arrested, and among his papers were found evidences of a plot for an insurrection in England, and an invasion of Scotland by the king of Sweden. In the preparations for defence, jealousy of Sunderland led to a schism in the ministry, and Walpole and others resigned. Stanhope now took the lead of the ministry. In 1718 a quadruple alliance was formed with Holland, France, and the emperor. In the short war that followed Admiral Byng annihilated the Spanish fleet at Cape Passaro, Aug. 11. There had long been hostility between the king and the prince of Wales, on account of the prince's mother, the unhappy Sophia of Celle. This lady had been suspected of an intrigue with Count Königsmark, who suddenly disappeared and was supposed to have been assassinated, while the princess was divorced in 1694 and imprisoned from that time till her death in 1726. The prince of Wales was attached to his mother, and the enmity with his father broke out into open hostility at the end of 1717. The prince left St. James's palace, and his residence, Leicester house, became a rival court. An important event of 1718 was the passing of a bill for the relief of Protestant dissenters. At this time arose the financial enterprises which culminated in the South sea company, of which the king was elected governor. Among the companies of the time were many of real value, but the principle of financial combination was extravagantly overrated; and when in 1720 the great South sea bubble burst, the general panic was overwhelming. The ministry was held responsible, and it was even expected that the king would abdicate. Lord Stanhope, in replying to an attack in the house of lords, was seized with a fit and died; on the following day (Feb. 5, 1721) Craggs, secretary of state, died of the smallpox, and Sunderland left the treasury. Walpole came to the front again,

supported by a house of commons strongly whig. In 1722 a new Jacobite plot was formed, but was detected, and Bishop Atterbury was banished for complicity in it. A patent was granted to William Wood, a proprietor and renter of copper mines in England, enabling him to coin farthings and halfpence for Ireland. This lucrative privilege was secured through the duchess of Kendal, the king's mistress; Walpole guarded against fraud, and Sir Isaac Newton, as master of the mint, approved the contract; but the issue caused immense disturbance in Ireland. Dean Swift wrote a pamphlet which raised a furious popular clamor, and the patent had to be withdrawn. In 1723 the *regium donum*, the grant to Presbyterians and other dissenters, was increased, and in 1724 the king founded professorships of modern history at Oxford and Cambridge. In 1725 the lord chancellor Macclesfield was impeached for malversation. There were many schemes for the overthrow of Walpole; but that sagacious statesman showed as much ability in disconcerting his private enemies as in his management of the national affairs. He kept the nation at peace, and secured a season of prosperity and progress. War was rekindled in 1725 by the alliance between the king of Spain and the emperor, and the treaty of Hanover between England, France, and Prussia, and subsequently Sweden. The siege of Gibraltar was begun by Spain in January, 1727; and a British fleet was sent to the West Indies, but accomplished nothing. Preliminary articles of peace were signed at Paris, May 31, 1727. In 1726 the King's unhappy wife died at her place of imprisonment. He is said to have been warned that he would survive her only a year. On June 3, 1727, immediately upon the agreement for peace, he set out for his beloved Hanover, accompanied by the duchess of Kendal and Lord Townshend. On the 10th he was taken with a fit in his carriage, and died before he could reach Osnabrück. He was buried in Hanover. He was a man of moderate faculties, a cruel husband and a bad father, with gross vices, yet by no means a bad sovereign. He did not attempt to interfere with the liberties of England; the ministry of Walpole was singularly able; and the policy of union with France, upheld by the same party which had been the war party of the preceding reign, was wise and statesmanlike beyond the time, it being for the interest of the nation as well as of the house of Hanover that the union between France and the house of Stuart should be broken up. By his queen Sophia of Celle George I. left a son, George Augustus, who succeeded him, and a daughter, Sophia Dorothea, who was married in 1706 to Frederick William I. of Prussia.

GEORGE (Augustus) II., son of the preceding and of Sophia Dorothea, born in Hanover, Oct. 30, 1683, died in Kensington palace, Oct. 25, 1760. Little is known of his early history,

except that he was neglected by his father, and was brought up by his grandmother, the electress Sophia. He visited Holland in 1699, and in 1705 married Wilhelmina Dorothea Caroline, daughter of the margrave of Brandenburg-Anspach, a woman of marked character and superior talent. The next year he was made a peer of England, his chief title being duke of Cambridge, with precedence over the peerage. He made the campaign of 1708 under the duke of Marlborough, and conducted himself with great bravery at the battle of Oudenarde, having his horse shot under him. In the opposite ranks, and showing equal valor, was the pretender, son of James II. He accompanied his father to England in 1714, and was proclaimed prince of Wales on Sept. 22. The quarrel between father and son broke out soon, and they hated each other cordially. The prince had been preferred by the electress Sophia to her own son, and was attached to his mother, two causes that sufficed to increase his father's original dislike of him. He was, moreover, seized upon as an instrument of political intrigue against his father. The king also hated the princess of Wales, and was jealous of her popularity. So vindictive was his feeling that he entertained a proposition, made by the earl of Berkeley, to carry off the prince to America, there to be so disposed of as never to trouble his father again. When the prince left St. James's palace, at the close of 1717, the king sought to deprive him of all control of his children; and the matter being referred to the judges, 10 of the 12 decided in his favor. A sort of reconciliation was effected in 1720, through Walpole's influence. When he ascended the throne, George II. endeavored to transfer power to the hands of Sir Spencer Compton, but his incapacity was so evident that Walpole retained his place, the more easily as he was supported by Queen Caroline. The coronation took place Oct. 11, 1727. The history of the first 14 years of the reign of George II. is that of the struggle of Walpole and the opposition, the fiercest civil political contest, unstained by blood, that England has ever known. The hopes that had been entertained of Walpole's overthrow as a consequence of the death of George I. had been disappointed, and that great minister's power was now fixed on a firm basis. The new parliament contained an overwhelming ministerial majority, and the king soon became strongly attached to the minister both on personal and political grounds. The royal avarice was gratified and the royal ease consulted by the minister, and hence the king supported the latter with all his influence; but the support he received from the queen, who governed her husband without his knowing it, was of greater importance. George II. was as fond of Hanover as his father had been, and visited it often, to the disgust of his English subjects. He hated his son Frederick, prince of Wales, as bitterly as he had himself been hated by his father, and the queen shared his

feelings in that respect. Frederick was not allowed to visit England till 1728. The prince long bore the king's parsimony and harsh treatment without complaint, and perhaps would have done so to the last if it had not been for the interest of the opposition to make him acquainted with his political importance, and to stir him to resentment, because the king supported Walpole personally. The first great act of this reign was the treaty of Seville, concluded in 1729, between England, France, Spain, and Holland, which was very advantageous to England, and by which Spain silently acquiesced in the English possession of Gibraltar. Walpole quarrelled with his colleague Townshend in 1730, and the latter resigned office and retired altogether from public life. Walpole was supreme in the cabinet, and appears to have been disposed to make some improvements in the laws and to correct abuses; but the virulence with which all his measures were opposed in parliament compelled him to be cautious. In 1729 and 1730 a committee of parliament investigated the condition of prisons, and secured some important reforms. In 1731 the use of Latin in the courts of justice was discontinued, and English substituted. The sinking fund, which Walpole himself had aided to establish, was so encroached upon that it soon ceased to be of any value. The great contest on the excise question was the most remarkable incident of the first half of the reign. The mere report of the intention to introduce a scheme of general excise caused alarm, and the opposition, which had been reduced very low, immediately became vigorous. The battle was fought with ability and courage on both sides, and though in some of its stages the ministerial majorities were 60, they finally fell to 16, in a house of commons which had given Walpole almost 200 majority on other questions. The bill was then withdrawn, greatly to the satisfaction of the people. The king was as much beaten as the minister, and they revenged themselves by dismissing from office, or from sinecure places, a number of distinguished noblemen who had been prominent in opposing the measure, the chief of whom was Lord Chesterfield. A new quarrel broke out in Europe in 1733 in regard to the Polish succession. Walpole maintained the neutrality of England even in spite of the king's preference for war, and finally won the king to his policy; and under the mediation of England peace was concluded in 1735. The election of 1734 resulted in the return of a strong Walpolean majority. The opposition sought the repeal of the test act, and were beaten by 128 majority. The gin act, which sought to do something to lessen drunkenness, was passed in 1736. The prince of Wales was married in 1736, and the question of his income afforded the opposition means to annoy the ministry, and caused the quarrel between father and son to become bitter than ever. At the birth of his first child the prince left Hampton court and took up his residence at Norfolk house.

The queen died in 1737, recommending her husband to Walpole with her last breath. In 1738 a son (afterward George III.) was born to the prince of Wales; and about this time the king gave notice that no visitor of the prince should be admitted to the court of St. James's. The opposition gathered more and more about the prince, and William Pitt became one of the gentlemen of his bedchamber. The opposition endeavored to have the army reduced in 1738, but failed. They then assailed the ministry because of its indifference to the outrages perpetrated by the Spaniards in America on Englishmen there trading. An arrangement made with Spain was unpopular. Pitt's fame may be dated from his speech against it. The ministerial majority was greatly reduced, but the minister was saved by the folly of his enemies, a number of whom seceded. The troubles with Spain went on, and war was declared against that country, Oct. 19, 1739. The ministerial strength now diminished, and the hopes of the Jacobites revived. The war was by no means brilliantly conducted. Anson's cruise in the Pacific and Indian seas revived the recollections of the Elizabethan age, and Vernon took Portobello; but the English failed at Cartagena, and also at Santiago de Cuba. The war of the Austrian succession began soon after, and England was drawn into it. Parliament was dissolved, and the new elections took place under circumstances unfavorable to Walpole. When parliament assembled, the opposition found themselves in a majority, and after a hard battle Walpole gave way, much to the grief of the king, who continued to take his advice to the last days of his life. Sir Robert was created earl of Orford, and the attempts made to prosecute him fell through. Lord Wilmington became premier, and Carteret secretary of state. Success was ruinous to the opposition, which showed it could not administer affairs, though so eloquent in fault-finding. The public was greatly disappointed, and the refusal of the victors to repeal the septennial act, which had been the object of their especial indignation when out of office, caused much disgust. England had now become actively engaged in the Austrian war, supporting the settlement called the pragmatic sanction, by which the Austrian succession devolved upon the late emperor's eldest daughter, Maria Theresa of Hungary, while France and Spain maintained the claims of Charles Albert, elector of Bavaria. A large force was sent to Flanders, which did nothing. Some success was achieved by the navy, and a British squadron compelled Naples to observe neutrality. The king, brave and fond of military life, was desirous of placing himself at the head of an army, and a large German force was taken into English pay. This added to the hatred of Hanover already felt in England. The king joined the allied army in June, 1743, and a few days later was fought the battle of Dettingen, in which the French were beaten, the monarch showing much courage. The death of

Lord Wilmington led to Henry Pelham's elevation to the premiership, the king acting under the advice of Walpole. Carteret continued to manage foreign affairs, and was much liked by the king. The Hanoverian policy was still vigorously opposed, but the resolute conduct of France, the fear of invasion, and the revival of the Jacobite party, caused some remission of party feeling, and the adoption of strong measures by government, the whigs of all views uniting in their support. The French government called Charles Edward Stuart to France, and extensive preparations were made to invade England, which failed through the occurrence of a storm, the fleet being destroyed or dispersed, February, 1744. War was declared against France a few weeks later, but little success attended it, and Carteret, now Earl Granville, was compelled to leave the ministry. Pelham forced the king to admit Chesterfield and some others of the old opposition to office, and Pitt gave his support to the government. The Hanoverian policy was kept up despite these changes, and England entered on an extensive system of German subsidies. Great preparations for the campaign of 1745 were made, but with no gain to England. The allies, commanded by the earl of Cumberland, were beaten by the French at Fontenoy. Charles Edward landed in Scotland, was joined by many highlanders and others, and, after occupying much of the ancient kingdom of his race, marched into England as far as Derby, when his leading supporters compelled him to retrace his steps. He was proclaimed at Perth and at Edinburgh. He won the battle of Gladsmuir or Preston Pans, and if he had pressed forward to London the capital would probably have fallen into his hands. George II., though very brave, and prepared to place himself at the head of his guards for a last fight, made preparations to fly. The rebels defeated the royal troops at Falkirk, but three months later their army was annihilated at Culloden (April 16, 1746). From that time dates the extinction of the Stuart party. The rest of the war was inglorious, and it was terminated by the treaty of Aix-la-Chapelle in 1748. For some years there was but little political discussion, and the opposition dwindled into a small faction, headed by the prince of Wales, which became extinct soon after his death in 1751. Private bills excited more interest in parliament than public ones. An increase in the stringency of the mutiny bill, and the passage of a regency bill, caused some discussion. The reformation of the calendar was effected by statute in 1751, providing that the year should commence on January 1 instead of March 25, and 11 days be dropped out of the month of September, 1752, thus bringing the year in accordance with the Gregorian calendar. The bill for the naturalization of the Jews, passed in 1753, though one of the most creditable acts of English legislation, caused so much popular excitement that it was immediately

repealed. In the same year was passed the marriage act, requiring the publication of the banns and a proper license, which was exceedingly unpopular, but is thought to have been a great blessing to the nation. The premier died March 6, 1754, and was succeeded by his brother, the duke of Newcastle, who found himself compelled to share power with others. His first ally was Henry Fox, afterward Lord Holland, and at a later day William Pitt. In 1754 the French aggressions in America became troublesome, and in July, 1755, occurred Braddock's defeat at Fort Duquesne. The seven years' war began in 1756, and England was involved in a contest of the severest character with France, while at the same time she was the ally of Prussia, which was at war with the empire, France, Russia, and lesser powers. The contest extended over the world, and was marked by great actions in Europe, in North America, and in the East Indies. The early part of the war was inglorious to England. In June Calcutta was taken by Surajah Dowlah, and his prisoners were confined in the Black Hole. But shortly after the formation of the Pitt and Newcastle ministry in 1757, the genius of Pitt changed the fortune of the contest, and the English were triumphant in every quarter. Ample subsidies were furnished to Frederick of Prussia, so that he was enabled to make head against the coalition formed for his overthrow. An army of English and Germans defeated the French in Germany, at Crefeld, Minden, and elsewhere. North America was the scene of great operations, which ended in the expulsion of the French. An expedition to France, twice renewed, inflicted considerable damage on that country, destroying, among other things, the works at Cherbourg. The success of Clive laid the foundation of the British Indian empire; Senegal and Goree were conquered; and the victory of Admiral Hawke over Confans, in the naval battle of Quiberon, established English supremacy on the ocean. Never had England stood so high as she stood in 1760. In the midst of these successes, forming so striking a contrast to most of his reign, George II. suddenly died at the age of 77. He was a man of ordinary character, and never had been popular with his English subjects; but he had governed constitutionally, and in his reign the liberal polity was established, and the industrial system of England began to display itself.

GEORGE (William Frederick) III., grandson of the preceding, and son of Frederick, prince of Wales, and of Augusta of Saxe-Gotha, born June 4, 1738, died in Windsor castle, Jan. 29, 1820. He was not likely to be well educated in the court of his father, nor did the death of that parent improve his prospects in that way. His mother confined his early associations to a small circle, wishing to preserve him from the profligacy of the day, in which she was successful; but he was brought up more as a Stuart prince might have been than as the heir

apparent to the throne of a constitutionally governed state. His disposition was arbitrary and crafty, and the whole of his long reign, until he lost his intellect, was passed in a continual combat against liberal ideas and institutions. At first he was popular. Young, a native of the country, and but little known to the people, his accession (Oct. 25, 1760) was hailed with loud rejoicings. His first speech in parliament contained a sentence, originated by himself, expressing pride in his English birth and confidence in the people, which excited great enthusiasm. He married, Sept. 8, 1761, the sister of the duke of Mecklenburg-Strelitz, Charlotte Sophia, who shared his throne for 57 years, and bore him 15 children, all but two of whom grew up. The fact that he had offered himself in 1761 to Lady Sarah Lennox seems to be proved by the statement of her brother-in-law, the first Lord Holland, and her son, Capt. Henry Napier, contained in "Holland House," by Princess Marie Liechtenstein (London, 1873). The new king was resolved upon being a king in fact as well as in name. To afford an opportunity to attempt the inauguration of the new system, it was necessary that peace should be restored, though the war was very popular, and Pitt, the war minister, was at the height of his power. The earl of Bute, long connected with the king's father and mother, was introduced into the cabinet, and ultimately became premier, and put an end to the war, though not until a new war had been made in consequence of Spain having joined France. When the family compact was made between France and Spain, Pitt was for anticipating the latter and commencing the war, but was overruled in the cabinet, where almost every man hated him because of his inordinate egotism and arrogance. He resigned his office Oct. 5, 1761; but the event showed the wisdom of his advice, for the conduct of Spain was such that England was compelled to declare war against her, Jan. 4, 1762. This war was a series of successes on the part of England. Havana was captured with a large part of the island of Cuba, the Philippines were reduced, treasure ships of immense value were taken from the Spaniards, and the naval and colonial supremacy of England was established. The effect was to make the premier more determined than ever upon peace, which was finally brought about at Paris in 1763, on terms that were honorable to England, though party spirit caused them to be denounced as treacherous, insecure, and disgraceful. The king became unpopular, and the minister was the object of violence. Lord Bute resigned in April, and was succeeded by George Grenville, whose administration commenced with the famous contest with Wilkes and the "North Briton." The restoration of peace enabled the king to seek the development of his political plans, and for many years he was engaged in a warfare against those principles to uphold which his house had been called to the British throne.

While George Grenville was minister, in 1765, the stamp act was passed, which threw the North American colonies into a blaze, and was the first in that series of acts which in their entirety make up the American revolution. The same year the first indications appeared of that mental malady which clouded the king's latter days. In July the Grenville ministry was dismissed, and the new ministry of Rockingham repealed the stamp act. In 1766 Pitt was made earl of Chatham, and formed a new ministry; and during this administration the taxation was renewed which ultimately led to American independence, although Chatham had little or nothing to do with this measure. He resigned in October, 1768. In 1769 appeared the famous letters of Junius attacking the policy of the ministry, and especially the duke of Grafton, who resigned in January, 1770, and Lord North, who had been chancellor of the exchequer, became premier, and held the place for 12 years. The modern tory party dates from that time as a powerful and efficient organization. The king ruled as well as reigned, and the attacks on American liberty were his acts, the guilt of the minister consisting in his being the tool, against his own convictions, of a master who was not always in possession of his reason. The year 1771 is memorable for the successful assertion by the newspaper press of the right of reporting the debates of parliament. The printer of the debates was arrested on the king's proclamation, but released by the London magistrates. In 1772 the king's message, provoked by the marriage of his brother in a manner he did not approve, secured the passage of the act, still in force, making the sovereign's consent necessary to marriages in the royal family. The American war began in the spring of 1775, and for seven years the most desperate efforts were made to conquer the colonies, which in 1776 declared themselves independent. Besides large bodies of English troops, and Tories and Indians recruited in America, thousands of German mercenaries were employed in the war, which was marked by just enough of success to encourage the king to persevere. Gradually other countries were drawn into the contest, until it had assumed a European character. War between France and England began in 1778, and Spain and Holland were soon ranked among England's active enemies. The northern powers formed the armed neutrality. The combined fleets of France and Spain obtained command even of the English channel. Gibraltar was beleaguered by an immense fleet. Lord Chatham urged a conciliatory policy with the Americans in 1777. The same year Burgoyne's army surrendered, and four years later Cornwallis capitulated. The fortunes of England were never before so low; and though the successful defence of Gibraltar, and the naval victory won by Rodney over De Grasse, closed the war with some flashes of glory, the contrast between the state of things then and

20 years before was most humiliating to all reflecting Englishmen. The king was compelled to submit to a whig ministry, headed by the marquis of Rockingham and Charles James Fox (March, 1782). Lord Rockingham's death (July 1) caused the new ministry to fall to pieces, and power passed into the hands of the earl of Shelburne and the younger William Pitt. American independence was acknowledged, and peace restored, though the king was even then resolute to continue the contest, and talked of retiring to Hanover because of the coercion to which he was subjected. The Shelburne ministry was driven from power by the famous coalition of the Foxite whigs with the Tories who followed Lord North (April, 1783). The king hated this ministry intensely, and talked of going to Hanover more than ever, and probably refrained from going because of the hint that while it would be easy to reach that country, it would not be so easy to get back to England. His submission was short-lived. The coalition broke down in an attempt to put a stop to the misgovernment of India. Its India bill passed the commons, but was thrown out by the lords in consequence of royal influence having been brought to bear on the minds of some of the peers. The king then dismissed the ministry, and placed Pitt at the head of his councils (December). After the new ministry had carried on a conflict with the coalition party in the commons until the latter had lost its majority, parliament was dissolved, and in the elections that followed the coalition was annihilated. The king, with the Pitt ministry, was now as popular as formerly he had been odious, and the tory party commenced a reign of nearly half a century. The prince of Wales was now of age. His loose life was all the more distasteful to the king because his associates were mostly whigs. As George I. had hated his eldest son, and George II. followed his father's example, so did George III. hate the heir apparent. Public affairs, however, went on smoothly, save that the impeachment of Hastings, who was patronized by the king, was brought about by the aid of Pitt. In August, 1786, an attempt upon the king's life was made by an insane woman named Margaret Nicholson. The labors of John Howard had led to legislation for prison reform. Various expedients were tried, and in 1787 the first convicts were transported to New South Wales. In 1788 the king was severely assailed by that illness which finally rendered him incapable of attending to business. A fierce struggle was commenced between parties, the object of the whigs being to have the prince of Wales made king under the title of regent should the royal illness continue, while the Tories were determined to abridge materially the powers of the regent. The recovery of the king put an end to the contest, and was the subject of great national rejoicing. Immediately afterward occurred the commencement of the French revolution, which arrested his attention; and

that great movement found in him the most determined of its enemies. Before the breaking out of the war with France, a dispute took place with Russia, the object being to prevent the conquest of Turkey by Catharine II. The opposition rallied and gained strength, but Turkey was saved. Another dispute occurred with Spain, but did not lead to war. The war with revolutionary France began in 1793; and though the English maintained their naval character, defeating the French off Brest on June 1, 1794, at the Nile on Aug. 1, 1798, and elsewhere, the Spaniards at Cape St. Vincent, Feb. 14, 1797, and the Dutch at Camperduin, Oct. 11, their military character was not raised by its events. The most arbitrary rule was maintained at home, and nothing but the firmness of English juries prevented the establishment of as complete a reign of terror in Great Britain as existed in France. Ireland was goaded into rebellion, which was suppressed by measures as cruel and bloody as any perpetrated by the French republicans in La Vendée and Brittany. The union between Great Britain and Ireland was effected in 1800, the parliament of the latter ceasing to exist, while she was allowed to send 100 members of the house of commons and 80 representative peers to the imperial parliament. Peace was made with France in 1802, though against the king's wishes, his opinion being always in favor of bloodshed, unless his enemy should unconditionally submit. The French had been driven out of Egypt, and Malta captured from them. The peace was but a hollow truce, and the refusal of the English to give up Malta led to the renewal of the war in 1803. The Pitt ministry had broken down in 1801, really on the question of peace with France, but ostensibly because of the king's bigotry, he refusing relief to the Catholics, though it had been understood that it was to be granted as one of the conditions of the Irish union. Henry Addington became premier, and kept his post until after the renewal of the war, when Pitt returned to office. The threats of Napoleon to invade England, and the vast preparations he made for that purpose, caused the people to rally around the throne, and an immense force was on foot, of regulars, militia, and volunteers, while the navy was much increased. Spain was drawn into the war on the side of France, and their united fleets were destroyed in Nelson's victory at Trafalgar (1805), which made England irresistible on the ocean, and settled the invasion question for that generation. For some time the war on the part of England was chiefly confined to the ocean, though she assisted the enemies of France with money. Such military expeditions as she fitted out were on a small scale, and mostly failed. In South America, in Egypt, in the north of Europe, her armies either were beaten or accomplished nothing; and it was not until the breaking out of the Peninsular war in 1808 that, under the command of Moore and

Wellesley, they performed anything worthy of the high name of their country. Pitt died in 1806, and the government passed into the hands of a coalition ministry, of which Lord Grenville and Mr. Fox were the chiefs. The object of the latter was the restoration of peace with France, but he died before anything could be done. The coalition endeavored to grant some relief to the Catholics, but the king got rid of them, and a ministry of tories was formed, headed by the duke of Portland (end of March, 1807). This ministry was probably the worst England ever had, and though it succeeded in the attack on Denmark, taking possession of the Danish fleet, the immorality of that attack more than balanced its success. Operations in Spain and Portugal were badly conducted; and the Walcheren expedition in 1809, which might have struck a deadly blow at Napoleon's power while he was combating Austria on the Danube, was probably the worst managed undertaking even in English history. This failure led to the breaking up of the Portland ministry, for which the Perceval ministry was substituted, an improvement on its predecessor, inasmuch as Marquis Wellesley took the foreign office. The commencement of the 50th year of the king's reign, October, 1809, was observed as a jubilee. There was little occasion for rejoicing. The war had failed utterly on land; France ruled almost the whole of continental Europe; the disputes with the United States threatened to add a new enemy to those England already had; while the conduct of some of the king's sons was flagrantly profligate. His second son, the duke of York, was compelled to resign the post of commander-in-chief, in consequence of the exposures made by Mrs. Clarke. In 1810 died the princess Amelia, the king's youngest and favorite daughter, and the king suffered so much from anxiety during her illness that he lost his reason for ever. More than once he had been raving mad. The first indication of his disease appeared on the very day of the completion of the 50th year of his reign, Oct. 25, 1810. His reign ceased in fact from that date, although in law it lasted more than nine years longer. The prince of Wales became prince regent by act of parliament on Feb. 5, 1811. The national events of the regency will be found under the title GEORGE IV. The care of the king's person was given first to the queen, and in 1819 to the duke of York. To his early education George III. owed a want of frankness and a moodiness when angry which did him much harm. But though he began his reign ignorant and ill educated, he learned much, and his last years of rule were as popular as the first had been unpopular. His original purpose to make himself an arbitrary monarch yielded to the rebuffs of his many defeats, and his personal morality and manly integrity and piety caused him to be respected and even beloved. A weak man naturally, and perhaps never strictly sane, he reigned

50 years, and left a memory in refreshing contrast with that of his immoral and un-English predecessors.

GEORGE (Augustus Frederick) IV., son of the preceding and of Queen Charlotte, born Aug. 12, 1762, died June 26, 1830. He was educated with great care, and closely restrained until 18 years of age, when he commenced a career of extravagance and profligacy that contrasted painfully with the upright life of his father. He early formed a connection with Mrs. Mary Robinson, an actress, and the wife of an attorney, who afterward became well known from her novels, verses, and autobiography. He became intimate with Fox, Sheridan, and other whig leaders, who were his companions in dissipation, and whose politics he adopted, in open opposition to his father. In 1788 his friends came into power as the famous coalition ministry, and on Nov. 11 he took his seat in the house of lords as duke of Cornwall, and as a supporter of the new administration, while they immediately demanded for him an augmented establishment and allowance, and Carlton house was assigned to him as a residence. When his friends fell from office he stood by them, and tried to restore them. In 1786 the debts of the prince were brought before parliament by Sheridan, but the king would not sanction a bill of relief. In the preceding year the prince had privately married Mrs. Fitzherbert. There is no doubt about the marriage, but it was illegal as being without the consent of the king; and Mrs. Fitzherbert being a Roman Catholic, the marriage, if valid, would have excluded the prince from the succession. When it was referred to in the debate on the prince's debts, Fox denied it, as he said, by the highest authority. In 1791 a difference arose between the prince and his sporting companions, and he sold his horses, shut up Carlton house, and devoted himself to the payment of his creditors, and in a speech in the house of lords separated himself from his old political friends. In 1795 he espoused his cousin, Caroline of Brunswick, in order to get his debts paid. After they had lived together for a year, during which their only child, the princess Charlotte, was born, they separated by common consent. Anxious for a complete divorce, the prince endeavored to prove his wife unfaithful. At this time he had returned to associations with Fox and his old friends, and was made a rallying centre by the whigs, while the tories naturally clung to the princess, who had the sympathy of the king. Under these circumstances took place the first investigation by parliament into her conduct. The main decisions of the investigation, which alone were made public, acquit the princess fully, although the matter was made a subject of political dispute. It seems that at most she was guilty while in England only of imprudent acts, and her father-in-law always protected her, not only because he had caused the marriage, but because he hated her hus-

band. It was not until he became regent in 1811 that the prince of Wales assumed political importance, and he then gave himself up to the tories. The years 1810 and 1811 were the period of Napoleon's greatest power. By conquest or by alliance continental Europe was under his control, although Sicily and Portugal were under the protection of England. In 1811 coolness arose between Napoleon and the czar Alexander. Early in 1812 Sweden became allied with Russia in resistance. The memorable Russian campaign followed. Wellington had taken Badajoz and Ciudad Rodrigo, and won the battle of Salamanca, and England rejected Napoleon's overtures for peace. War broke out this year with the United States, and success at first attended the English arms on the borders of Canada, while the frigate *Constitution* captured the British frigate *Guerriere*. In 1813 the war continued with varying fortune in America, and Wellington entered France in October. Napoleon was driven by the discontent at home to the campaign of 1814, beginning in January; but while by a bold movement he placed himself in the rear of his allied enemies, the latter marched upon Paris, which they entered March 31, and Napoleon abdicated and was taken to Elba. In America the city of Washington was taken, Aug. 24, but peace was signed with the United States at Ghent, Dec. 24. On March 1, 1815, Napoleon landed at Cannes, and an army was at once formed to oppose him in the Netherlands, of which Wellington took command on April 5. The victory of Waterloo, June 18, made England the most important power of Europe. The only wars of England now were in India, while the attention of the country was mainly given to the development of home industry and the agitation for parliamentary reform. An attempt was made in 1817 to assassinate the prince, and there was much discontent at his extravagance and vice. His daughter, the princess Charlotte, died in 1817. He became king, Jan. 29, 1820. The Cato street conspiracy for the assassination of the ministry absorbed attention at the beginning of his reign. The king soon commenced an open persecution of his wife which agitated the whole country. A bill of pains and penalties was introduced into the house of lords, charging the queen with adultery. The trial lasted for many weeks, and the bill passed to a third reading Nov. 10; but the majority for it was so small and public opinion so decidedly pronounced against the prosecution, that the government withdrew it. Nominally victorious, the queen was really beaten, and died of chagrin in less than a year. The king visited Ireland, Scotland, and Hanover, and apparently was popular. He was, however, greatly perplexed by politics. The progress of liberal opinions was making itself felt in England, and the ministry had to go with the world. Castle-reagh's suicide and Canning's promotion were

sources of much trouble to him. The foreign policy of Canning, decidedly opposed to the policy of the holy alliance, was eminently distasteful to him. When a French army, at the bidding of the holy alliance, entered Spain to restore absolutism (1823), England was greatly moved, and probably nothing but financial considerations prevented war with France. When Portugal appealed for English aid against Spain, that aid was promptly given. The independence of the Spanish American countries was effectually promoted. The Greek revolution added to the interest which the English felt in foreign affairs, from classical associations. Internal policy was liberalized. Peel led the way, through a tory minister, in meliorating the criminal law; Huskisson's commercial ideas began to make head; Brougham labored in the cause of education; and the work of Catholic emancipation went vigorously forward. The year 1824 was a period of great material prosperity, and was followed by a crash in 1825. The Burmese war, begun in 1824, ended in 1826 with a considerable accession to the British territory on the eastern coast of the bay of Bengal. Early in 1827 the duke of York, heir presumptive to the crown, died, and the title was transferred to the duke of Clarence, while his office of commander-in-chief was given to the duke of Wellington. Lord Liverpool, who had been prime minister since 1812, was incapacitated from further attention to business by illness. The contest that followed for the premiership ended in the triumph of Canning, whereupon seven of his associates resigned, and he was compelled to reconstruct the cabinet, which he did on a liberal basis. He died, however, before he could accomplish anything. His successor was Lord Goderich, whose ministry lasted but a few months, during which the Turkish fleet at Navarino was destroyed by the combined squadrons of England, France, and Russia; an event which the king called "untoward" in his speech at the opening of parliament. The ministry of Goderich was followed by that of Wellington, January, 1828, with the duke as first lord of the treasury and Peel as home secretary. The return of the tories to power was the signal for the revival of the emancipation agitation, and the Catholics proved successful in 1829. The ministry had to choose between civil war and giving up their principles, and they made the sacrifice required of them. The king, whose bigotry and dread of popular ideas increased with his years, stood out to the last against the current of opinion, but was forced to give way. The dissenters had previously been freed from disabilities. These acts, noble though they were, proved the ruin of the tory party, and so demoralized it that it could not stand before the feeling that was soon after roused over Europe by the French revolution of 1830. The king was taken seriously ill early in that year, and died in midsummer. The duke of Wellington, who

was no flatterer, said of him after his death: "He was the most extraordinary compound of talent, wit, buffoonery, obstinacy, and good feeling—in short, a medley of the most opposite qualities, with a great preponderance of good—that I ever saw in any character in my life." His short reign had been remarkable for the advance made in liberal sentiments, and for the many practical reforms which it had witnessed; changes with which the sovereign had little to do. The England of 1830 bore but small resemblance to the England of 1820, and still less to that of 1810, when as regent George IV. had commenced the life of a sovereign. He left no legitimate children, and was succeeded by the duke of Clarence, third son of George III., as William IV.

GEORGE I., king of Greece, born in Copenhagen, Dec. 24, 1845. He is the second son of Christian IX., king of Denmark, and brother of the princess of Wales. On June 6, 1863, he accepted the crown of Greece under the title of king of the Hellenes, relinquishing (Sept. 12) his rights of precedence in Denmark in favor of his younger brother Waldeemar, and was permitted to remain a Lutheran on condition of his children being brought up in the Greek faith. In 1866 his sister the princess Dagmar married the Russian czarévitch; and on Oct. 27, 1867, he married the grand duchess Olga, a daughter of the grand duke Constantine and a niece of the reigning czar, who has borne him a son (Aug. 2, 1868), the crown prince Constantine, duke of Sparta, and three other children. The principal event of his reign was the Cretan insurrection of 1866-'9, which led to serious complications with Turkey. (See GREECE.)

GEORGE V., ex-king of Hanover, born in Berlin, May 27, 1819, died June 12, 1878. He was a son of King Ernest Augustus and of a sister of Queen Louisa of Prussia, and married in 1843 the princess Mary of Saxe-Altenburg. Although he became totally blind in his youth, he succeeded to the throne on the death of his father, Nov. 18, 1851, and soon created dissatisfaction by his affiliations with eccentric and unpopular courtiers, and by his ultra-conservative principles. Although he was a Protestant and a grand master of freemasons, his Roman Catholic minister Windthorst persuaded him to favor ultramontanes, while he engaged a tutor of the same faith for his elder son, and the ex-queen was reported in 1871 to have joined the church of Rome. His unstable policy resulted in a perpetual change of ministers, and in 1865 he restored a reactionary cabinet under Bismarck. Despite his relationship with the Prussian dynasty, and the remonstrances of his most influential favorite, the secretary general Zimmermann, he showed a deep aversion for Prussia; and as he ostentatiously sided with Austria at the outbreak of the war of 1866, his territory was invaded by the Prussians in June, and annexed by King William Sept. 20. He fled to

Vienna, where he kept up an incessant agitation against Prussia; and as even after he had agreed, in February, 1868, to accept 16,000,000 thalers as an indemnity for his lost kingdom, he persisted in his spiteful attitude, the Prussian government ordered (March 2) the provisional suspension of the payment of that amount.

GEORGE, prince of Denmark, born April 21, 1653, died Oct. 28, 1708. He was the second son of Frederick III. and Sophia of Lüneburg. On the death of his father in 1670 war was renewed with Sweden, and the prince took part in the campaign of his brother Christian V. against Charles XI., when the rival kings commanded and fought in person. On July 28, 1688, he married the princess Anne of England, second daughter of the duke of York, afterward James II. She bore him 17 children, all of whom died before their mother's accession to the throne. The prince was wholly devoid of talent, as of ambition. "I have tried him drunk," said Charles II., "and I have tried him sober; and drunk or sober, there is nothing in him." But he was brave, good-natured, and humane; taking no part in politics, and deserting his unhappy father-in-law in the hour of need, chiefly by the desire and after the example of his wife. He had been brought into the conspiracy through her subservience to Churchill, the future duke of Marlborough, but his extreme insignificance rather excited the raillery of the king, even on this sad occasion. "After all," said James, hearing of his defection, "a good trooper would have been a greater loss." After the triumph of the prince and princess of Orange, Prince George was naturalized by act of parliament and created by the new king duke of Cumberland, in acknowledgment of his cooperation in the great measure which had been achieved. He accompanied the king to Ireland, and was present at the battle of the Boyne. On the accession of his wife, the "good Queen Anne," to the throne, in 1702, he was made lord high admiral of England. He had previously been invested with the title of generalissimo of all the queen's forces. As admiral he was assisted by a council consisting of four members. The legality of this board was much doubted, but parliament was so obsequious to the queen, that it was suffered to act without question.

GEORGE I. The patron saint of England, born, it is supposed, at Lydda or at Ramleh in Palestine in the latter half of the 3d century, said to have died in Nicomedia, April 23, 308. He appears to have been brought up in Cappadocia and to have embraced the military profession. It is the prevailing opinion of critics that Eusebius refers to him in his "Ecclesiastical History" (B. viii., c. 5), in speaking of "a man of no mean origin, but highly esteemed for his temporal dignities," who, when Diocletian's edict against the Christians was posted up in Nicomedia, "took it down and tore it in pieces." As the emperor was then present in the city, this deed of one of his officers en-

tailed on the offender the most cruel punishment. Reverence for the sufferer soon extended through Phœnicia, Palestine, and the whole East. A Greek inscription dated 346, on a very ancient church at Ezra, in Syria, mentions George as a holy martyr. Constantine the Great built a church over the tomb of the saint between Lydda and Ramleh; and the latter place, which claimed also to be his birthplace, was then called Georgia. In Constantinople a temple of Juno was converted by the same emperor into a church of St. George, to which his remains were translated. About the same time the name of "St. George's arm" was bestowed upon the Hellespont. In Rome, Palermo, and Naples churches also bore his name from a very early date. Queen Clotilde in 509 founded in his honor a convent at Chelles, and Clovis II. a convent at Baralle in Normandy. St. George was honored in England during the Anglo-Saxon period. Under Canute a monastery of St. George was founded at Thetford; St. George's, Southwark, was built a little later; and in the reign of the Conqueror there was a collegiate church of St. George in Oxford. England, Aragon, Portugal, and Genoa chose him as their patron. In 1222 a council held at Oxford ordained that St. George's day should be a national holiday. In 1470 Frederick of Austria instituted an order of knighthood called after him. About 1350 Edward III. made him the patron of the order of the garter. St. George is also the patron saint of Russia. St. George slaying the dragon was the cognizance of the grand dukes until the marriage of Ivan III. with the Greek princess Sophia, when the two-headed eagle, the Byzantine emblem, was adopted. It is still the emblem of Moscow. The Russian order of St. George was founded by Catharine II. in 1769. Besides the universal veneration in which he is held by Christians in the East, especially in Georgia, the Mohammedans revere him under the appellations of Ghergis and El-Khouder. The historian John Cantacuzenus enumerates several shrines erected by them in his honor; and Dean Stanley found a chapel on the seashore near Sarafend (ancient Sarepta) dedicated to El-Khouder. The George whose relics are shown in St. Germain-des-Prés, Paris, is a Syrian deacon martyred in Spain in 852; but his name is not in the Roman martyrology. The honor paid to St. George the martyr was sanctioned by Pope Gelasius I. in 494, in a council at Rome; but the "acts" were rejected as unworthy of credit. The crusaders found him honored by the Greeks with the surname of *Tropæophoros* or Victorious. He is generally represented, according to a comparatively modern legend, as slaying a dragon sent by a magician Athanasius to devour a princess Alexandria. This came from his being confounded with George of Cappadocia. II. Called the Fuller, the Arian, and George of Cappadocia, born in Epiphaneia, Cilicia, about 300, died in Alexandria

toward the close of 361. From the fuller's shop kept by his father, he is said by Ammianus to have raised himself to opulence by unworthy means. He collected a valuable library, became the leader of the Arians in Asia Minor, and through the influence of Constantius was chosen in 356 bishop of Alexandria, while Athanasius was still living. He and his military supporters persecuted their religious opponents, pillaged the pagan temples, ruined commerce by monopolizing all trade, and proposed the impost of a heavy tax on households. Driven from the city by the revolted inhabitants, he was restored by military force; but on the accession of Julian he and his two principal followers were imprisoned by the pagans, and after 24 days were taken out and butchered. Gibbon and other writers confound George of Cappadocia with St. George the martyr; but Heylin and Milner, with whom Milman agrees, have shown them to be distinct personages.

GEORGE, Enoch, a bishop of the Methodist Episcopal church in the United States, born in Lancaster co., Va., in 1767 or 1768, died at Staunton, Va., Aug. 23, 1828. After preaching one year at the head waters of the Catawba and Broad rivers, in North Carolina, he was received into the conference on trial in 1790, and sent to Pamlico circuit. For four years he travelled over extensive circuits in the states of Virginia, North Carolina, South Carolina, and Georgia, when he was obliged to retire from active ministerial labor on account of physical debility. In 1799 he resumed the itinerant work in Rockingham circuit, Virginia. In 1800 he had charge of an immense district extending from Chesapeake bay to the Alleghanies, but again his health failed, and for two years he taught a school in Winchester, Va. In 1808 he resumed his ministerial labors, acting as pastor of churches in Frederick, Alexandria, Montgomery, and Baltimore, and as presiding elder of the Baltimore, Alexandria, and Georgetown districts till 1816, when he was elected to the episcopacy. He continued to labor effectively in this office to the date of his death. He was remarkable for a peculiar and powerful style of preaching, and for great humility.

GEORGE, Lake, a picturesque sheet of water in Warren and Washington cos., New York, 36 m. long from N. E. to S. W., from $\frac{1}{2}$ m. to 4 m. wide, and in some places 400 ft. deep, discharging into Lake Champlain on the north. It is remarkable for the transparency of its water, its multitude of little islands, popularly supposed to correspond in number with the days of the year, and the beautiful scenery of its banks. Black mountain, on the E. shore, has an elevation of 2,200 ft. above the surface of the lake; and 12 m. distant from it is a very steep rock rising 200 ft. from the water, down which it is said Major Rogers, when pursued by Indians during the French war, slid and landed safely on the ice. Not

far from this spot is the place where the English under Lord Howe landed previous to their attack on Fort Ticonderoga. The ruins of that fort can be seen at the E. end of the narrow channel through which the waters of Lake George are conveyed to Lake Champlain. Steamers ply upon the lake in summer, between Caldwell and Fort Ticonderoga, conveying large numbers of tourists attracted by its beautiful scenery. Caldwell, Bolton, and other places on its banks, are favorite summer resorts.—Lake George was discovered by the French from Canada early in the 17th century. Champlain knew of its existence in 1609, and saw it some time between that year and 1613. It was named by Father Jogues Lake St. Sacrement, from the festival of Corpus Christi on which he reached it, May 27, 1646. The English subsequently named it after King George II. By the Indians it was called Andiatarocet, or "the place where the lake closes." Cooper in his "Last of the Mohicans" called it Horicon, the name Horiconi being given on some old maps as that of an Indian tribe in the vicinity, probably by a misprint for Horiconi, that is, Iroquois. It bears a conspicuous place in American history. For more than a century it was a channel of communication between Canada and the settlements on the Hudson. In the French and Indian war it was repeatedly occupied by large armies, and was the scene of several battles. On Sept. 7, 1755, occurred engagements between the French and English, near the S. end of the lake, in which Col. Williams of Massachusetts, the founder of Williams college, was killed, Baron Dieskau, the French commander, severely wounded, and the French totally defeated. In 1757 Fort William Henry, at the same end of the lake, was besieged by the French general Montcalm, at the head of 10,000 men. The garrison, after a gallant defence, capitulated, and were barbarously massacred by the Indian allies of the French. In July, 1758, the army of Gen. Abercrombie, about 15,000 strong, passed up the lake in 1,000 boats, and attacked Ticonderoga without success. In July, 1759, Gen. Amherst with an almost equal force also traversed the lake and took Ticonderoga and Crown Point. The head of Lake George was the depot for the stores of the army of Gen. Burgoyne before he began his march to Saratoga.

GEORGE OF TREBIZOND, a Greek scholar, born in the island of Crete in 1396, died in Rome in 1486. He arrived in Italy in 1430 at the invitation of Francesco Barbaro, a noble Venetian, and became professor of Greek literature and philosophy at Venice. Pope Eugenius IV. invited him to Rome in the same capacity, and made him his secretary; and he was continued in these functions by Nicholas V. Though he was famous throughout Italy, some of his hasty translations of the Greek authors into Latin drew upon him attacks from Lorenzo Valla and Theodore Gaza, and his eulogies of Aristotle and attacks upon Plato pro-

voked the enmity of the Florentine admirers of Plato, and particularly of Cardinal Bessarion. His subsequent life was a series of disputes, and his writings are remarkable for violent personalities.

GEORGES, Marguerite Joséphine, mademoiselle, a French actress, born at Bayeux, Feb. 23, 1787, died at Passy, Jan. 12, 1867. She was a daughter of an actress and of a military tailor, Wemmer (long erroneously called Weymer). Some juvenile performances of hers at Amiens attracted the notice of the actress Raucourt, by whose influence she was brought to Paris and educated. Her imposing beauty and powerful acting produced a great sensation at her first appearance in 1802 as Clytemnestra; but as she desired to shine also in less austere characters, in which Mlle. Duchesnois excelled, a contest arose which subsequently resulted in her clandestine departure for Vienna, and soon afterward for Russia. The emperor Alexander I. became so infatuated with her that he would not consent to her returning to France, and in 1808 she played before him and Napoleon in Dresden and at Erfurt. Napoleon, one of her warmest admirers, and Hortense, one of her earliest patronesses, procured her readmission at the Théâtre Français in 1813, and the payment of her salary from the time of her entrance in 1803. Here Talma imparted great finish to her style; but in 1816 she again broke her engagement. Excepting occasional performances in England and Germany and the French provinces, she was subsequently connected with the Odéon and the Porte St. Martin theatres from 1821 to 1847, sustaining her reputation as a most impassioned and majestic tragedian. She gave farewell performances in 1849, and despite increasing stoniness she appeared once more in 1855. She was most admired as Semiramis, Merope, Dido, Agrippina, Lucrezia Borgia, Mary Tudor, and Catharine de' Medici. She received costly presents from emperors and princes, and from a host of other admirers and lovers; yet on retiring from the stage her poverty impelled her to become a teacher at the conservatory.

GEORGETOWN, an E. county of South Carolina, bordering on the Atlantic, bounded S. W. by Santee river and intersected by the Great Pedee, Black, and Waccamaw, which unite just above the seat of justice and enter the ocean through the estuary called Winyaw bay; area, 818 sq. m.; pop. in 1870, 16,161, of whom 13,888 were colored. The surface is level and partly occupied by marshes and pine forests. The soil is generally fertile. The chief productions in 1870 were 14,094 bushels of Indian corn, 7,644 of sweet potatoes, 5,324,970 lbs. of rice, and 61 bales of cotton. There were 4 manufactories of barrels and casks, 5 of tar and turpentine, 1 saw mill, and 1 planing mill. Capital, Georgetown.

GEORGETOWN. I. A port of entry of the District of Columbia, situated at the head of navigation on the left bank of the Potomac,

125 m. from its mouth, and $2\frac{1}{2}$ m. N. W. of the capitol, Washington, from which it is separated by Rock creek, which is spanned by four handsome iron bridges; pop. in 1850, 8,366; in 1860, 8,733; in 1870, 11,384, of whom 3,217 were colored and 1,020 foreigners. On the north and west it is overlooked by heights, commanding a magnificent view of Washington and the Potomac, and a vast expanse of country, and crowned by villas and country seats. It is a quiet but thriving place, noted for its refined society and educational advantages. The custom house and post office building is near the centre. On the N. W. slope of the heights is Oak Hill cemetery, encompassed by an iron fence, and beautified by original forest trees; it was laid out in 1849. Extensive street improvements are in progress. The Chesapeake and Ohio canal has its terminus at Georgetown, where a branch is carried across the Potomac by an aqueduct 1,446 ft. long, and 36 ft. above the ordinary tide, over which is an elevated roadway. Georgetown is the only port of the District, and is connected by steamship lines with New York, Philadelphia, Boston, Baltimore, and Norfolk, and carries on a considerable coasting trade. The value of foreign commerce for the year ending June 30, 1873, was \$29,555. The canal furnishes excellent water power, which is utilized by a number of extensive flour mills, and brings down large quantities of bituminous coal from the Cumberland mines. The principal literary institution is Georgetown college, under the direction of the Jesuits, which was founded as a college in 1789 and chartered as a university in 1815. It consists of a classical, a medical, and a law department. The classical department has a senior division (corresponding to the ordinary college course), divided into four classes; a junior division, divided into two classes; and a preparatory department, with two classes; the whole covering seven years. There is also a post-graduate course of two years. Besides more than 3,000 volumes in the students' libraries, the college possesses a library of some 30,000 volumes, among which are many rare and curious works. There are 100 volumes printed between the years 1460 and 1520; three manuscripts anterior to the year 1400, and one of the year 1280. The faculty consists of the president and 20 professors and instructors. The number of students in 1872-'3 was 187, viz.: senior division, 58; junior division, 65; preparatory, 69. The number of graduates was 11. The medical department was organized in 1851, and a school of pharmacy has recently been established in connection with it, in which diplomas are given for proficiency. In 1872-'3 there were 10 professors and 56 students, of whom 24 graduated in medicine and one in pharmacy. The law department was established in 1870, and in 1872-'3 had 4 professors and 56 students, of whom 28 graduated. These two departments are in Washington. The college buildings, which are

spacious, are at the W. end of Georgetown, and are surrounded by handsome grounds. Near the college is a convent of Visitation nuns, founded in 1799, and attached to the latter a female academy, with a library of 2,500 volumes. Georgetown institute is an English and classical school for boys. The whole number of private schools in 1872 was 21 (including 6 for secondary instruction), with 869 pupils. There were 4 public school houses and 17 separate schools, including 7 for colored children, having 19 teachers and an average attendance of 705 children. The principal charitable institutions are the aged women's home and the industrial home school for juvenile vagrants. There are a national bank, an insurance company, a weekly newspaper, a monthly periodical (published by the college students), and 13 churches.—Georgetown was laid out in pursuance of an act of the colonial government of Maryland dated June 8, 1751, and was incorporated as a city Dec. 25, 1789. The charter was abolished upon the organization of the territory of the District of Columbia in 1871, but the locality is still known as the "city of Georgetown." (See DISTRICT OF COLUMBIA.) II. A town, port of entry, and the capital of Georgetown co., South Carolina, situated on the W. shore of Winyaw bay, near the confluence of the Black and Great Pedee rivers, 15 m. from the sea and 110 m. E. S. E. of Columbia; pop. in 1870, 2,080, of whom 1,379 were colored. The entrance to the harbor is obstructed by a bar. The neighboring country produces large quantities of rice. The value of foreign commerce, consisting wholly of exports, for the year ending June 30, 1873, was \$64,537; entered, 6 vessels of 907 tons; cleared, 21 vessels of 3,813 tons. In the coastwise trade 80 vessels of 19,387 tons entered, and 14 vessels of 2,250 tons cleared. There were 7 sailing vessels of 767 tons, and 9 steamers of 773 tons, belonging to the port. III. A town and the capital of Scott co., Kentucky, built on high ground in the midst of the fertile section known as the "blue grass region," on the North Elkhorn river, 17 m. E. of Frankfort; pop. in 1870, 1,570, of whom 728 were colored. It contains two factories, two banks, and a weekly newspaper. It is the seat of Georgetown college (Baptist), founded in 1829, occupying three large buildings, and having in 1872 8 professors, 135 students (41 preparatory), and a library of 7,000 volumes. The western Baptist theological institute, founded at Covington in 1840, was removed to Georgetown in 1854, and is conducted in connection with Georgetown college. In 1872 it had 2 professors and 24 students. Georgetown female seminary (Baptist) in 1872 had 7 instructors and 110 students. Warrendale female college (Reformed) had 4 instructors and 70 students.

GEORGETOWN (Dutch, *Stabroek*), the capital of British Guiana, and of the county of Demerara, situated on the E. bank of Demerara

river, at its mouth, here about 1 m. wide; lat. $6^{\circ} 49' 24''$ N., lon. $80^{\circ} 11' 30''$ W.; pop. about 27,000, of whom one quarter are whites. It is regularly built, with broad, clean streets, intersecting at right angles, and neat wooden houses having open verandas in front, thickly shaded and surrounded by gardens. Canals communicating with each other and with the river run through the middle of most of the streets, and are crossed by numerous bridges. The great business thoroughfare is Water street, facing the river, and inhabited exclusively by Europeans. The principal edifice is the town hall, a large stone building, with marble-paved galleries supported by iron columns. The Episcopal cathedral is a handsome stone building, besides which there are one Episcopal and ten other churches, a college, many schools, two hospitals, a lunatic asylum, two banks, two theatres, a handsome promenade, several artesian wells, and a market place surrounded by well supplied shops. Below the town is Fort Frederick William, and near it, at the mouth of the river, a lighthouse. Georgetown is unhealthy, owing to its low, marshy situation. By way of security against dampness the houses are raised on piles three or four feet above the ground. Diarrhoea, dysentery, dropsy, and yellow and intermittent fevers are prevalent diseases. There is a bar at the mouth of the river, on which is 15 feet of water. The principal exports are coffee, sugar, and rum. The value of imports for the year ending Dec. 31, 1871, was \$6,804,949 68; amount of duties collected, \$609,719 43; value of exports, \$18,080,943 12. Entered, 72 steamers of 9,216 tons, and 854 sailing vessels of 216,165 tons; cleared, 72 steamers of 9,216 tons, and 906 sailing vessels of 192,758 tons.

GEORGIA, one of the thirteen original states of the American Union, situated between lat.

$30^{\circ} 21'$ and 35° N., and lon. $80^{\circ} 48'$ and $85^{\circ} 40'$ W., having an extreme length N. and S. of 320 m., and an extreme breadth E. and W. of 254 m.; area, 58,000 sq. m. It is bounded N. by Tennessee and North Carolina, N. E. by South Carolina, from which it is separated by the Savannah river, E. by the Atlantic ocean, S. by Florida, and W. by Alabama, from which it is partly separated by the Chattahoochee river. It is divided into 136 counties, viz.: Appling, Baker, Baldwin, Banks, Bartow, Berrien, Bibb, Brooks, Bryan, Bullock, Burke, Butts, Calhoun, Camden, Campbell, Carroll, Catoosa, Charlton, Chatham, Chattahoochee, Chattooga, Cherokee, Clarke, Clay, Clayton, Clinch, Cobb, Coffee, Colquitt, Columbia, Coweta, Crawford, Dade, Dawson, Decatur, De Kalb, Dodge, Dooly, Dougherty, Douglas, Early, Echols, Effingham, Elbert, Emanuel, Fannin, Fayette, Floyd, Forsyth, Franklin, Fulton, Gilmer, Glascock, Glynn, Gordon, Greene, Gwinnett, Habersham, Hall, Hancock, Haralson, Harris, Hart, Heard, Henry, Houston, Irwin, Jackson, Jasper, Jefferson, Johnson, Jones, Laurens, Lee, Liberty, Lincoln, Lowndes, Lumpkin, Macon, Madison, Marion, McDuffie, McIntosh, Meriwether, Miller, Milton, Mitchell, Monroe, Montgomery, Morgan, Murray, Muscogee, Newton, Oglethorpe, Paulding, Pickens, Pierce, Pike, Polk, Pulaski, Putnam, Quitman, Rabun, Randolph, Richmond, Rockdale, Schley, Scriven, Spalding, Stewart, Sumter, Talbot, Taliaferro, Tatnall, Taylor, Telfair, Terrell, Thomas, Towns, Troup, Twiggs, Union, Upson, Walker, Walton, Ware, Warren, Washington, Wayne, Webster, White, Whitefield, Wilcox, Wilkes, Wilkinson, and Worth. The counties are subdivided into 1,186 militia districts, and contain 184 incorporated towns. There are eight cities, viz.: Savannah (pop. in 1870, 28,235), the chief port, on the river of

Obverse.

Reverse.

State Seal of Georgia.

the same name, 18 m. from the sea; Atlanta (pop. 21,789), the capital, in the N. W. part of the state; Augusta (pop. 15,389), on the Sa-

vannah, 248 m. from its mouth; Macon (pop. 10,810); Columbus (7,401); Athens (4,251); Milledgeville (2,750), the former capital; and

Rome (2,748). Among the towns are Albany, Americus, Bainbridge, Brunswick, Cartersville, Covington, Cuthbert, Dalton, Dawson, Eatonton, Fort Valley, Griffin, La Grange, Marietta, Newnan, Thomasville, Valdosta, Washington, and West Point, having each more than 1,000 inhabitants.—The population of the state in 1790 and at subsequent decennial periods was as follows:

U. S. CENSUS.	White.	Free colored.	Slave.	Total.
1790.....	52,886	898	29,264	82,548
1800.....	101,678	1,019	56,404	159,101
1810.....	145,414	1,501	105,218	252,133
1820.....	189,564	1,767	149,556	340,887
1830.....	284,506	2,484	217,581	504,571
1840.....	407,095	2,753	290,944	699,892
1850.....	521,572	2,931	381,682	906,185
1860.....	581,550	3,500	462,198	1,047,248
1870.....	683,926	545,142	.....	1,184,109

Included in the last total are 1 Chinaman and 40 Indians. Georgia ranked 12th among the states in 1870 in total population, a gain since 1860 of 12 per cent.; 16th in the number of white inhabitants, gain 8.01 per cent.; and 1st in colored population, gain 17.06 per cent. There were 1,172,982 natives and 11,127 foreigners, 578,955 males and 605,154 females. Of the natives, 933,962 were born in the state, 54,937 in South Carolina, 26,858 in North Carolina, 19,034 in Virginia and West Virginia, 12,230 in Alabama, 9,894 in Tennessee, and 4,781 in Florida. There were 374,142 persons born in the state living in other states and territories. Of the foreigners, 5,098 were natives of Ireland, 2,761 of Germany, and 1,088 of England. Of the colored, 501,814 were blacks, and 48,328 mulattoes. The number of male citizens of the United States 21 years old and over was 234,919. There were 237,850 families, having an average of 4.98 persons to a family, and 236,436 dwellings, averaging 5.01 to a dwelling. There were 418,553 persons 10 years old and over unable to read, and 468,593 unable to write, of whom 343,637 were colored and 1,070 foreigners, 220,070 males and 248,528 females; 101,114 were between 10 and 15 years of age, 92,120 from 15 to 21, and 275,342 21 and over. Of the last number, 21,899 were white males and 100,551 colored males. The number of blind persons was 740; deaf and dumb, 326; insane, 634; idiots, 871; paupers, 1,816, of whom 507 were colored and 39 foreigners; persons convicted of crimes during the year, 1,775. There were 444,678 persons 10 years old and over engaged in occupations, viz.: 336,145 in agriculture, 64,083 in professional and personal services, 14,410 in trade and transportation, and 27,040 in manufactures and mining. Included in these numbers were 264,605 agricultural laborers, 70,468 farmers and planters, 953 clergymen, 37,027 domestic servants, 14,976 laborers, 851 lawyers, 1,537 physicians and surgeons, 2,225 teachers, 5,429 traders and dealers, 3,545 clerks, salesmen, &c.,

5,105 officials and employees of railroad companies, 1,279 carmen, draymen, &c., 2,262 blacksmiths, 1,375 boot and shoe makers, 1,005 masons and stone cutters, 4,723 carpenters and joiners, 3,519 cotton and woollen mill operatives, 1,206 millers, 1,215 saw-mill operatives, and 2,604 tailors, seamstresses, &c.—Georgia presents a great variety of surface. Along the coast and the Florida line it is low and swampy, while a little further back occur parallel ranges of sand hills, 40 or 50 ft. high. Near the S. E. corner is the Okefinokee swamp, or rather series of swamps, about 180 m. in circuit, filled with pools and islands, covered with vines, bay trees, and underwood, and teeming with alligators, lizards, and other reptiles. The elevation for 20 m. inland rarely exceeds 40 ft., and averages 10 to 12 ft. above the sea. Then the land suddenly rises by a terrace 70 ft. higher, and this table land continues nearly level about 20 m. further inland, when another rise of 70 ft. leads to a third tract, which continues to ascend toward the north, till at Milledgeville, about 150 m. from the sea, the elevation is about 575 ft. From the central portion of the state the surface becomes more elevated, the hills increasing in size toward the north. The southern spurs of the Appalachians, which cross the N. portion of the state from N. E. to S. W., are reached in the Etowah hills of Bartow and Cherokee counties, and the Amicolola hills of Gilmer and Lumpkin; and the Blue Ridge, ranging with these between Lumpkin, White, and Haersham counties on the south, and Union and Towns on the north, constitutes the great watershed. These mountains attain an elevation of from 1,200 to 4,000 ft.—The coast of Georgia extends S. S. W. from Tybee sound to Cumberland sound, a distance of about 100 m., with a shore line estimated at 480 m. Though generally uniform as to course, it is very irregularly indented, and is skirted by numerous low islands which extend parallel to the shores. The principal of these from N. to S. are Cabbage, Ossabaw, St. Catharine's, Sapelo, St. Simon's, Jekyll, and Cumberland. The inlets and sounds which divide the islands from one another and from the mainland are generally navigable, but too shoal to admit vessels of more than 100 tons. Vessels of larger dimensions can enter only four harbors: Savannah, Darien, Brunswick, and St. Mary's. The bar of the Tybee entrance of the Savannah has 19 ft. of water; that of the Sapelo entrance of the Altamaha, 14 ft.; that of St. Simon's sound (entrance of Brunswick harbor), 17 ft.; and that of St. Mary's river, 14 ft. These figures represent the least water in the channel ways at low water of mean tides; the mean rise of tides on this part of the coast varies from 7 ft. in the Savannah to 5.9 ft. in the St. Mary's.—The Savannah, the largest river of Georgia, and the boundary toward South Carolina, rises by two head streams, the Tugaloo and Keowee, in the Appalachian chain, and near the sources of the Tennessee and Hiawas-

see on the one side and of the Chattahoochee on the other. From the junction of these confluents (lat. $34^{\circ} 28'$) the river has a S. S. E. course of 450 m. to the sea, which it meets near lat. 32° and lon. 81° . It is navigable for large ships to Savannah, 18 m., and for steamboats of 150 tons to Augusta, 280 m. further; and by means of a canal round the falls navigation for small steamboats is prolonged for 150 m. above. The Chattahoochee rises near the W. constituent of the Savannah, pursues at first a S. W. course, but at West Point (lat. $32^{\circ} 52'$) on the Alabama line turns S. and enters Florida (lat. $30^{\circ} 41'$) under the name of the Apalachicola. Its whole length to the gulf is about 550 m., and steamboats ascend it 300 m. to the falls at Columbus. Flint river rises in the hilly country S. of the Chattahoochee, and joins that river in the S. W. corner of the state after a course of 300 m.; it is navigable for steamboats to Albany. The Ocklockonnee, Withlacoochee, and Allapaha drain the S. section of the state, and pass through Florida to the gulf of Mexico. The Withlacoochee and Allapaha by their junction in Florida form the Suwanee. Next to the Savannah, the Altamaha is the largest river falling into the Atlantic. It is formed by the junction of the Oconee and Ocmulgee, which rise in the hilly region S. of the Chattahoochee and flow for about 250 m. nearly parallel to each other, when the latter bends to the east and unites its waters with those of the former. The main river is navigable for sea-going vessels to Darien, and steamboats ascend the Ocmulgee to Macon and the Oconee to Milledgeville. The Ogeechee drains the country between the Savannah and Altamaha, and has a S. E. course of 200 m., with 30 or 40 m. of sloop navigation; its southern branch, the Cannouchee, is navigable for 50 m. The Santilla and St. Mary's drain the S. E. section of the state; both are navigable for sloops about 40 m., and for boats much further; the St. Mary's forms the boundary toward Florida. The N. and N. W. sections of the state are drained by the Tacoah, the Notley, and other tributaries of the Hiawassee; and by the Oostenaula and Etowah, which, uniting at Rome, form the Coosa, one of the tributaries of the Alabama. The Tallapoosa, also a tributary of the Alabama, has its sources in this state between the Coosa and Chattahoochee.—Georgia is naturally divided into two regions distinguished by their geological structure, as well as by their topography, climate, and vegetable productions. The line of the first falls which are met with in ascending the streams marks here, as well as further N., the ascent upon the platform of granitic and palaeozoic rocks, which stretches on to the Appalachian mountains. This line crosses the central portion of the state from Augusta on the Savannah, by Macon on the Ocmulgee, to Columbus on the Chattahoochee. It is nearly parallel with the range of the Alleghanies, which crosses in a N. E. and S. W. direction

the northern portion of the state; but it is so distant from these mountains that the intervening hilly region of the metamorphic and lower Silurian rocks is here much broader than elsewhere along the eastern slopes of the Alleghanies. The width of the belt is not far from 150 m. On the south it is succeeded immediately by the lowest tertiary, the eocene, whose sands, clays, and calcareous and silicious strata are seen reposing upon the ancient metamorphic slates and gneiss along the line of contact with these. The cretaceous formation only intervenes from a point almost in the centre of the state, near Macon, gradually widening in its outspread toward the west and pushing the outcrop of the overlying eocene further to the south. The cretaceous group is also seen at a few isolated points rising through the tertiary near the Ogeechee river. S. of the line designated above, the whole country toward the gulf of Mexico and the Atlantic ocean is occupied by the eocene and the modern tertiaries of the coast; a belt wider even than that of the ancient formations of the N. half of the state. In the alluvium, which attains an elevation of only a few feet above the water, skeletons of the mastodon, mylodon, megatherium, an extinct species of elephant, and of the ox, have been found; and beneath the muddy peaty soil in which they lie the sands and clays are of the post-tertiary formation, containing fossil shells, all of the same species that now live in the neighboring salt water. In Bartow co. the limestones of the lower Silurian are met with just N. of the Etowah river, and the formation extends toward Tennessee, till in the N. E. corner of the state it is overlaid by later members of the palaeozoic rocks, which finally are capped by the coal formation. Near the junction of the limestone with the metamorphic rocks immense deposits of iron ore are found, in the latter ranging N. E. from the S. E. corner of Bartow through Cherokee co. Gold was discovered in 1829 in Habersham co. It occurs in veins and alluvial deposits in almost every county N. of the central line of the state, the W. limit being the W. base of the mountains. The chief deposits are in a belt, 15 to 20 m. wide, extending across the state on the E. slope. The production from 1829 to 1838 is estimated at 800,000 ounces; from 1838 to 1849, at 200,000 ounces; and it has gradually diminished until in 1870 only five mines were in operation, the product being valued at \$29,780. The amount of gold deposited at the United States mint and branches, from Georgia, to June 30, 1873, was \$7,267,784 76. The copper veins worked in Polk co., Tenn., are traced across the line into Gilmer co. The other mineral productions of the state, except the limestones, and in the eocene region the marls and buhrstone of this formation, are of little importance.—Among objects of interest are the falls of Tallulah, in a branch of the Tugaloo, in Habersham co.; Toccaco falls in the same

stream, 185 ft. high; Amicolah falls in Lumpkin co., with a descent of 400 ft. in as many yards; Towaligo falls in Monroe co.; the falls in Rabun co., and a series of falls in the Hiawassee. Stone mountain in De Kalb co., 7 m. in circuit, and 2,220 ft. high, abounds in fine scenery, and Track rock and Pilot mountain (1,200 ft. high) in Union co. are worthy of mention. Nicojack cave extends into the Raccoon mountains, near the N. W. extremity of the state, for several miles, with a portal 160 ft. wide and 60 ft. high, through which flows a stream, up which boats can pass for 8 m. to a cataract. In Hancock and Bartow co. and near Macon are artificial mounds, containing ruins of fortifications, articles of pottery, and human remains.—In the low lands and swamps along the coast the climate is hot and unhealthy, malarious fevers being prevalent, while in the pine lands further back the air is salubrious. In the N. portion of the state the climate is cooler and healthful. The following table embodies the results of meteorological observations made at Augusta and Savannah, under the direction of the chief signal officer of the United States, for the year ending Sept. 30, 1872:

MONTHS.	MEAN THERMOMETER.		TOTAL RAIN-FALL, INCHES.		PREVAILING WIND.	
	Augusta.	Savannah.	Augusta.	Savannah.	Augusta.	Savannah.
October	66°	66°	1.62	3.55	S. E.	N. E.
November	54	59	7.78	2.22	W.	S. W.
December	47	51½	4.98	1.59	N. W.	S. W.
January	41	46	5.20	2.09	N. W.	N. W.
February	46	50	5.87	4.65	W.	N. W.
March	59	53½	10.88	10.18	N. W.	N. W.
April	66	67	2.95	2.75	S.	E.
May	74	76	5.86	5.23	W.	S. W.
June	79	80	4.77	9.52	S. E.	S. W.
July	81	83	6.87	4.86	S.	S. W.
August	80	84	4.10	13.31	E.	E.
September	75	76	1.88	8.52	W.	S. E.
Year	68.3	66.2	61.75	51.96	W.	S. W.

The number of deaths in 1870 was 13,606, including 3,923 from general diseases, 1,519 from diseases of the nervous system, 445 of the circulatory, 2,247 of the respiratory, 2,230 of the digestive, and 241 of the integumentary system; 741 deaths were caused by enteric, 405 by intermittent, and 300 by remittent fever, 875 by consumption, 248 by dropsy, 270 by measles, 145 by cerebro-spinal fever, 277 by encephalitis, 379 by meningitis, 116 by apoplexy, 165 by paralysis, 214 by convulsions, 856 by croup, 1,363 by pneumonia, 233 by hydrothorax, 239 by enteritis, 327 by dysentery, 443 by diarrhoea, 844 by cholera infantum, and 100 by ascites.—The soil of the coast islands is light and sandy, but productive of long-staple or "sea island" cotton. The mainland possesses a rich alluvial soil, producing corn and cotton, while the tide swamps of the rivers are fertile in rice. Back from the coast is a stretch of sandy land, chiefly valuable for its timber and naval stores, but capable of being made

productive. The S. W. portion of the state is light and sandy, but yields good crops of cotton, and the middle region, possessing a red loamy soil, produces cotton, corn, tobacco, &c. These two portions of the state have been much exhausted by unscientific cultivation. The N. region contains much fertile land, particularly in the valleys, yielding grain, fruits, potatoes, and other vegetables, but is not so well suited to cotton. Near the coast, the growth along the banks of the streams is of canes, cypress, *magnolia glauca* and *grandiflora*, gum of different species, including the liquidamber tree, oaks, tulip, ash, sweet bay, and many other genera; while back upon the sandy lands pines and scrub oaks are almost the only trees. Several species of palmetto give a tropical aspect to the sea islands, and the magnificent live oaks largely obtained in the vicinity of Brunswick furnish the most valuable ship timber grown in the United States. In 1870 Georgia produced more cotton than any other state except Mississippi; more rice than any other except South Carolina; and more sweet potatoes than any except North Carolina. The number of acres of improved farm land was 6,831,856; value of farms, \$94,559,468; of farming implements and machinery, \$4,614,701; wages paid during the year, including the value of board, \$19,787,086; estimated value of all farm productions, including betterments and additions to stock, \$80,390,228; value of orchard products, \$352,926; of produce of market gardens, \$193,266; of forest products, \$1,281,628; of home manufactures, \$1,113,080; of animals slaughtered, or sold for slaughter, \$6,854,882; of live stock, \$30,156,317. The productions were 308,890 bushels of spring and 1,818,127 of winter wheat, 82,549 of rye, 17,646,459 of Indian corn, 1,904,601 of oats, 5,640 of barley, 402 of buckwheat, 410,020 of peas and beans, 197,101 of Irish potatoes, 2,621,562 of sweet potatoes, 143 of clover and 540 of grass seed, 48 of flaxseed, 22,277,380 lbs. of rice, 288,596 of tobacco, 846,947 of wool, 4,499,572 of butter, 4,292 of cheese, 2 of hops, 983 of flax, 14 of silk cocoons, 31,233 of wax, 610,877 of honey, 473,934 bales of cotton, 21,927 gallons of wine, 109,139 of milk sold, 553,192 of cane and 874,027 of sorghum molasses, 644 hogsheads of sugar, and 10,518 tons of hay. The live stock consisted of 81,777 horses, 87,426 mules and asses, 231,310 milch cows, 54,332 working oxen, 412,261 other cattle, 419,465 sheep, and 988,566 swine. There were in addition 28,460 horses and 111,764 cattle not on farms.—The number of manufacturing establishments was 3,836, having 405 steam engines of 10,826 horse power and 1,729 water wheels of 27,417 horse power, employing 17,871 hands, of whom 15,078 were males above 16, 1,498 females above 15, and 1,295 youth; capital invested, \$13,930,125; wages paid, \$4,844,508; value of materials, \$18,588,731; of products, \$31,196,115. The principal branches are shown in the following table:

INDUSTRIES.	No. of establishments.	Capital.	Value of products.
Agricultural implements	10	\$39,550	\$77,450
Boots and shoes	244	118,605	498,382
Brick	41	182,500	420,109
Carriages and wagons	178	267,295	664,512
Car repairing	3	122,050	306,960
Cars, freight and passenger ..	8	91,000	160,580
Cotton goods	25	3,064,050	3,888,647
Cotton thread, twine, and yarn	9	369,215	315,336
Fertilizers	6	51,500	168,950
Flouring and grist-mill products	1,097	3,108,918	11,202,039
Furniture	77	85,000	214,208
Iron, forged and rolled	8	215,860	555,556
Iron, pigs	4	12,300	47,212
Iron, castings	28	179,500	442,297
Leather, tanned	100	118,828	288,960
Leather, curried	86	72,934	283,346
Lumber, planed	7	89,500	571,200
Lumber, sawed	583	1,718,478	4,044,375
Machinery	42	806,700	1,624,623
Marble and stone work	9	192,800	160,760
Paper	8	170,000	184,028
Printing and publishing	45	416,798	929,151
Saddlery and harness	60	92,188	176,065
Sash, doors, and blinds	14	104,070	188,800
Tar and turpentine	4	68,000	95,970
Tin, copper, and sheet-iron ware	56	76,680	212,919
Tobacco and cigars	20	118,700	475,874
Wool carding and cloth dressing	85	42,150	118,940
Woollen goods	11	994,435	852,568

There are three ports of entry, Savannah, Brunswick, and St. Mary's. The imports from and exports to foreign countries, with the shipping belonging to the several ports, for the year ending June 30, 1873, are shown in the following table:

PORTS.	Value of imports.	Value of exports.	VESSELS REGISTERED, ENROLLED, AND LICENSED.	
			No.	Tons.
Savannah	\$320,258	\$32,675,500	79	18,587
Brunswick	4,096	967,027	16	2,211
St. Mary's	795	172,087	5	895
Total	\$325,149	\$33,834,614	100	21,198

The exports consist almost wholly of cotton and lumber, the cotton being shipped from Savannah. The quantity of the former was 376,431 bales, valued at \$32,169,060; of the latter, 48,425,000 feet of boards, clapboards, deals, &c., and 3,176,457 cubic feet of timber, together valued at \$1,609,140. Of the vessels, 27 of 9,009 tons were steamers. The entrances and clearances were as follows:

ENTERED.

PORTS.	FROM FOREIGN PORTS.				COASTWISE.			
	American vessels.		Foreign vessels.		Sailing vessels.		Steamers.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
Savannah	34	16,140	218	119,816	181	50,160	382	381,435
Brunswick	17	5,611	109	59,882	224	61,767	..	.....
St. Mary's	8	576	19	7,102	24	6,869	..	.....
Total	59	22,327	346	187,800	429	118,796	382	381,435

CLEARED.

PORTS.	FOR FOREIGN PORTS.				COASTWISE.			
	American vessels.		Foreign vessels.		Sailing vessels.		Steamers.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
Savannah	65	30,102	224	129,164	52	22,409	414	875,561
Brunswick	34	10,804	144	76,161	188	42,778	..	.....
St. Mary's	14	4,050	26	8,518	8	1,836	..	.....
Total	113	44,956	394	213,828	228	67,033	414	875,561

—The mileage of railroads in the state at different periods has been as follows: in 1841, 271; in 1851, 795; in 1861, 1,420; in 1871, 2,108. The Central railroad of Georgia, which extends from Savannah to Macon, leases and operates the Augusta and Savannah railroad, from Millen to Augusta; the Milledgeville and Eatonton, from Gordon to Eatonton; the Southwestern, which extends from Macon to Eufaula, Ala., 144 m., with branches from Fort Valley to Columbus (72 m.), Smithville to Albany (23½ m.), Cuthbert to Fort Gaines (20 m.), Fort Valley to Perry (18 m.), and Albany to Arlington (36 m.); the Macon and Western, from Macon to Atlanta; and the Upson County railroad, from Barnesville to Thomaston. The Georgia railroad, from Augusta to Atlanta, with branches from Camak to Warrenton (4 m.), Union Point to Athens (40 m.), and Barnett to Washington (18 m.), operates the Macon and Augusta line, which connects Warrenton and Macon. The Western and Atlantic railroad, from Atlanta to Chattanooga, Tenn., 188 m., was built by the state. The other lines are the Alabama and Chattanooga, from Chattanooga, Tenn., to Meridian, Miss., 295 m.; the Atlanta and West Point, between those places; the Atlantic and Gulf, from Savannah to Bainbridge, with branches from Thomasville to Albany (58½ m.), and from Lawton to Live Oak, Fla., 48½ m.; the Brunswick and Albany, between those points; the Cherokee, from Cartersville on the Western and Atlantic to Rockmart, to be extended to Pryor, Ala., 22 m. further; the Macon and Brunswick, between those places, with a branch from Cochran to Hawkinsville (10 m.); the North and South (in progress), from Columbus to Rome, 135 m.; the Rome, from that point to Kingston; the Savannah and Charleston, between those cities, 104 m.; the Savannah, Griffin, and North Alabama (operated by the Macon and Western), from Griffin to Newnan, to be extended to Guntersville, Ala., 116 m. further; the Selma, Rome, and Dalton, from Selma, Ala., to Dalton, 286 m.; the Atlanta and Richmond Air Line, from Atlanta to Charlotte, N. C., 268 m.; and a branch of the East Tennessee, Virginia, and Georgia railroad, from Cleveland, Tenn., to Dalton, 27 m. The mileage of these roads and branches in operation in Georgia in 1873, with the capital stock and cost as far as reported of those lying wholly or chiefly in the state, is shown in the following table:

RAILROADS.	Mile- age.	Cost of road and equipments.	Capital stock.
Alabama and Chattanooga	26	.....	.....
Atlanta and Richmond Air Line	106	.....	.....
Atlanta and West Point	86½	\$1,200,129	\$1,232,500
Atlantic and Gulf	322½	8,105,368	8,698,300
Augusta and Savannah	53	1,082,200	732,700
Brunswick and Albany	173	10,873,000	4,898,000
Central	192	5,000,000	5,000,000
Cherokee	23	.....	12,500 per mile.
E. Tenn., Virginia, and Georgia Georgia	15	.....	.....
Macon and Augusta	238	4,156,000	4,200,000
Macon and Brunswick	74	2,401,000	1,631,000
Macon and Western	197	7,250,000	3,000,000
Milledgeville and Easton	102½	2,500,000	2,500,000
Milledgeville and Easton	89	508,880	.....
North and South	80	500,588	5,000,000 { (\$886,819 paid in.) 250,844
Rome	20	235,235	.....
Savannah and Charleston	8	.....	.....
Savannah, Griffin, and N. Ala. Selma, Rome, and Dalton	86	469,128	449,588
Southwestern	68	.....	.....
Upson County	806½	4,587,818	4,211,600
Western and Atlantic	16	200,000	.....
.....	120	4,500,000	.....
Total	2,290	.....	.....

The canals of this state have been constructed for local convenience: that around the falls of the Savannah, at Augusta, is 9 m. long; another (16 m.) connects the Savannah and Ogeechee rivers, and another (12 m.) connects Brunswick and the Altamaha, making a total length of 37 m. All the chief towns are connected by telegraph. The number of national banks in 1873 was 12, having an aggregate capital of \$2,725,000; of state banks (including 3 savings banks and 2 trust companies), 16, with \$4,082,000 capital. There were 7 insurance companies in 1873, of which 2 were life companies, having a capital of \$1,785,418. —The government is administered under the constitution of 1868, which ordains that there shall be neither slavery nor involuntary servitude except as a punishment for crime, that the social status of the citizen shall never be the subject of legislation, that there shall be no imprisonment for debt, and declares that every citizen owes paramount allegiance to the constitution and government of the United States, and that the state shall ever remain a member of the American Union. All elections are by ballot, and the right of suffrage is conferred upon every male person 21 years old and upward who is a citizen of the United States, or has legally declared his intention to become such (except idiots, insane persons, and those who have been convicted of heinous crimes), who shall have resided in the state six months before the election, and 30 days in the county in which he offers to vote, "and shall have paid all taxes which may have been required of him, and which he may have had an opportunity of paying, agreeably to law, for the year next preceding the election." No one convicted of felony or larceny, unless pardoned, nor any defaulter in public funds, is eligible to office; nor can any resident of the state who sends or ac-

cepts a challenge, or engages in or aids or abets a duel, vote or hold office. General elections commence on the Tuesday after the first Monday of November, unless otherwise provided by law. The legislative power is vested in a general assembly, consisting of a senate and house of representatives. For senatorial purposes the state is divided into 44 districts, each returning one senator. The senators are elected for four years, one half retiring biennially, and must be citizens of the United States, 25 years of age, and have resided two years in the state and one year in the district from which they are elected. The house of representatives consists of 175 members apportioned among the counties, who are elected for two years, and must be citizens of the United States, 21 years of age, and have resided one year in the state and six months in the county from which they are elected. The legislature meets annually on the second Wednesday in January; no session can continue more than 40 days, unless prolonged by a vote of two thirds of each house. Appropriations to "sectarian corporations or associations" are prohibited. No town or city can be granted permission to become a stockholder in or to contribute to any railroad or work of public improvement, unless a majority of the voters desire it; and restrictions are placed upon the power of the state to become a stockholder in or to pledge its credit to any company. The executive power is vested in a governor, elected by a majority vote of the people, who holds office for four years or until his successor is qualified. If no candidate receives a majority, the general assembly chooses one of the two who have the highest number of votes. The governor must be 30 years of age, for 15 years a citizen of the United States, and for six years of the state. He is the commander-in-chief of the army and navy of the state and of the militia, may grant reprieves and pardons except in cases of impeachment, and has a veto upon acts of the legislature which can only be overcome by a two-thirds vote of each house. In case of the death, resignation, or inability of the governor, the president of the senate, and in case of the latter's inability, the speaker of the house of representatives, acts as governor until the disability is removed or a successor is elected. There are also a secretary of state, comptroller general, treasurer, and surveyor general, elected by the general assembly, an attorney general, and a state school commissioner, appointed by the governor with the consent of the senate, each holding office for four years. The power of impeachment is vested in the house of representatives. The senate, presided over by one of the judges of the supreme court, constitutes the court for the trial of impeachments, but no person can be convicted without the concurrence of two thirds of the members present. The supreme court consists of three judges, who hold office for 12 years, one reti-

ring every four years, and has appellate jurisdiction only of cases from the superior courts and the city courts of Savannah and Augusta. There is a judge of the superior court for each of the 19 judicial circuits, who holds office for eight years. These courts, except in matters of probate, have general original jurisdiction both civil and criminal, at law and in equity, issue writs of *certiorari* to inferior tribunals, and may have appellate jurisdiction conferred upon them by law. A session is held twice a year in each county. The judges are appointed by the governor with the consent of the senate, and may be removed by him upon the address of two thirds of each branch of the legislature, or upon impeachment and conviction. The judges of the supreme and superior courts and the attorney general must be 30 years of age, for three years citizens of the state, and must have practised law seven years. There is an ordinary for each county, elected by the people thereof for four years, who holds a court of ordinary and probate; from his decisions there may be an appeal to the superior court. A justice of the peace is elected by the qualified voters of each militia district for four years. Justices have jurisdiction in civil cases in which the sum claimed does not exceed \$100; when the amount is more than \$50, an appeal may be taken to the superior court. A notary public (*ex officio* a justice of the peace) for each militia district may be appointed by the governor for four years. County courts presided over by a single judge in each county were established by the act of Jan. 19, 1872, in most of the counties. The judges, who have the same jurisdiction as justices of the peace, are appointed by the governor with the consent of the senate for four years, and must be 25 years of age and residents of the county for which they are appointed. Each head of a family is entitled to exemption from execution on a homestead of realty to the value of \$2,000 in specie, and personal property to the value of \$1,000 in specie, "except for taxes, money borrowed and expended in the improvement of the homestead, or for the purchase money of the same, and for labor done thereon or material furnished therefor, or removal of encumbrances thereon." The militia consists of all able-bodied males 18 to 45 years of age, except those conscientiously opposed to bearing arms, who may purchase exemption. Amendments to the constitution may be proposed by a two-thirds vote of each house of two successive legislatures, after which they must be ratified by the people. No convention of the people shall be called by the legislature in the election of delegates to which any person qualified to vote by this constitution is disqualified, nor unless the representatives therein shall be based on population. Georgia is entitled to nine representatives in the lower house of congress. The rate of interest is 7 per cent. All property owned by a married

woman at the time of marriage, and all that may be given to and inherited or acquired by her, is her separate property, and not liable for the debts of her husband. A married woman may sue and be sued in matters pertaining to her separate estate as though single, and with the consent of her husband may trade as a *feme sole*. No total divorce can be granted except on the concurrent verdict of two juries. The grounds of total divorce are intermarriage within the prohibited degrees, mental or physical incapacity at the time of marriage, adultery, wilful and continued desertion for three years, conviction of crime and sentence to the penitentiary for two years or more, force, menace, duress, or fraud in procuring the marriage, and pregnancy at the time of marriage unknown to the husband. For cruel treatment or habitual drunkenness the jury may grant either a partial or a total divorce. Treason in the first degree, murder, arson of an occupied dwelling or of a house in a city, town, or village, castration, and rape may be punished with death. Other punishments are fines, imprisonment, and whipping, not more than 89 lashes.—According to the federal censuses, the valuation of property has been as follows:

YEARS.	ASSESSED VALUE.			True value of real and personal.
	Real.	Personal.	Both.	
1850 ..	.....	.....	.....	\$385,425,714
1860 ..	\$179,801,441	\$488,490,946	\$618,292,387	645,805,287
1870 ..	148,948,216	88,271,808	227,219,519	268,169,207

The diminution in the value of personal property is chiefly owing to the emancipation of the slaves. In 1870 the taxation not national amounted to \$2,627,029, of which \$945,894 was state tax, \$906,270 county tax, and \$775,865 town, city, &c., tax. The public debt was \$21,753,712, of which \$6,544,500 (funded, but not including bonds issued subsequently to 1868) was state debt; \$561,735, of which \$300,386 was funded, county debt; and \$14,647,477 town, city, &c., debt, of which all but \$264,162 was funded. The total receipts into the state treasury during the fiscal year amounted to \$1,164,804, of which \$732,898 was from general taxes, \$35,924 from liquor tax, \$5,778 from licenses, \$21,446 from corporations, \$45,000 from state railroad, \$10,292 from interest, \$310,000 from loans, and \$2,966 from miscellaneous sources. The disbursements amounted to \$1,444,817, of which \$17,085 was for the executive department, \$526,891 for legislative expenses, \$35,280 for the judiciary, \$2,547 for penitentiary expenses, \$114,647 for institutions for deaf and dumb, blind, and insane, \$20,000 for educational purposes, \$57,321 for printing, \$495,608 for payments and interest on public debt, and \$175,488 for miscellaneous expenses. The treasurer in his report for the year ending Dec. 31, 1873, gives the outstanding debt of the state, Jan. 1, 1874, as follows:

BONDS.

WHEN ISSUED.	When due.	Amounts.
1844 and 1848.....	1874	\$287,000
1873.....	1875	100,000
1873.....	1876	100,000
1873.....	1877	100,000
1873.....	1878	200,000
1858 and 1878.....	1879	800,000
1859 and 1878.....	1880	800,000
1860 and 1878.....	1880	800,000
1861 and 1878.....	1881	200,000
1873.....	1882	100,000
1873.....	1883	100,000
1873.....	1884	100,000
1873.....	1885	100,000
1868 and 1878.....	1886	4,000,000
1870.....	1890	2,098,000
1872.....	1892	807,500
Total.....	....	\$8,842,500

The issue of 1870 is gold bonds; the rest, currency. The total annual interest is \$586,460. During the administration of Gov. Bullock, 1868-'71, bonds to the amount of \$8,860,000 were issued, and the state indorsed bonds of various railroad companies to the amount of \$7,923,000. It having been charged that the greater part had been illegally and fraudulently issued or indorsed, a committee was appointed by an act of Dec. 9, 1871, to investigate the subject, which sat at Atlanta during March and April, 1872. Of the state bonds \$2,280,000 were returned and cancelled, \$3,482,000 were declared null and void by the legislature in accordance with the report of the committee, and \$2,598,000 were recognized as valid, \$2,098,000 of this amount being included in the preceding table. Of the indorsed bonds \$240,000 were returned and cancelled, with respect to \$4,475,000 all obligation is disclaimed, while \$194,000 of the Alabama and Chattanooga railroad, \$464,000 of the South Georgia and Florida railroad, and \$2,550,000 of the Macon and Brunswick railroad, in all \$3,208,000, are admitted to be binding upon the state. This amount being added to the aggregate of the table, the total recognized debt at the beginning of 1874 becomes \$11,550,500. The receipts during 1872, with the balance on hand at the beginning of the year, are shown in the following table:

Cash on hand, Jan. 1, 1872.....	\$186,767 01
Received from general tax.....	946,814 75
" from rent of Western and Atlantic railroad.....	800,000 00
" from sale of bonds.....	188,879 65
" from poll tax.....	128,972 48
" from school tax.....	103,706 90
" from sale of United States land scrip.....	90,202 17
" from temporary loans.....	47,782 50
" from tax on insurance companies.....	25,711 98
" from railroad, bank, and express tax.....	21,432 14
" from restitution money.....	19,674 21
" from pay for convict labor.....	9,577 26
" from liquor tax.....	9,388 80
" from balance from Fourth Nat'l bank.....	7,558 43
" from tax on circuses.....	8,201 25
" from dividends on Georgia railroad stock.....	8,081 80
" from special reciprocity tax on insurance.....	2,583 88
" from rent of capitol.....	1,966 88
" from miscellaneous sources.....	4,401 10
Total.....	\$2,101,340 84

The disbursements were \$1,335,207 14, viz.: \$692,892 paid on public debt, \$295,227 78 on special appropriation, \$172,251 92 on legislative pay rolls, \$99,408 49 on civil establishment, \$89,628 72 on contingent fund, \$26,977 28 on printing fund, \$5,261 32 on educational fund, and \$3,564 73 on overpayment of taxes; cash on hand Jan. 1, 1873, \$776,183 70, of which \$100,000 was set apart to pay coupons maturing on that day, and \$108,706 20 belonged to the special and \$184,277 46 to the general school fund. The total receipts in 1873 were \$2,406,655 04; total disbursements, \$2,250,282 49. The state owns the Western and Atlantic railroad, valued at \$7,000,000; 10,000 shares of stock in the Atlantic and Gulf railroad company (par value \$1,000,000), worth \$200,000; and 186 shares in the Georgia railroad and banking company, \$18,600; total, \$7,218,600. It also owns 1,833 shares in the bank of the State of Georgia and 890 shares in the bank of Augusta, but they have no market value. The Western and Atlantic railroad was leased to a company for 20 years in December, 1870, at the monthly rent of \$25,000. The assessed value of property in 1872 was \$243,620,466, of which \$226,633,263 was taxable. The taxable property in 1873 amounted to \$242,487,882. The rate of taxation was 50 cents per \$100; 40 cents for general purposes, and 10 cents for school purposes. The institution for the deaf and dumb, at Cave Spring, Floyd co., in 1873 had 5 instructors and 63 pupils, of whom 29 were males and 34 females. The academy for the blind, at Macon, had 4 instructors (2 blind) and 47 pupils. The state lunatic asylum, near Milledgeville, has 10 officers (2 non-resident); number of patients, Dec. 1, 1873, 576. The penitentiary is at Milledgeville. The convicts, 664 in number (93 white and 571 colored), are all leased to a corporation, and employed on public works in different parts of the state. The state has only one officer, the principal keeper, under pay, and derives a revenue from the lease.—Before the civil war no common school system existed in the state, although certain funds had been set apart, and were distributed to the various counties, for the education of indigent children. The constitution of 1868 required the legislature to establish a system of common schools, and to carry this provision into effect an act was passed in 1870, which has been superseded by the general school law of Aug. 28, 1872. This law constitutes the governor, attorney general, secretary of state, comptroller general, and state school commissioner, the state board of education, which is an advisory body to the commissioner, and hears as a court of last resort appeals from his decisions touching the administration or construction of the school laws. The state commissioner is charged with the administration of the school laws, and is general superintendent of the public schools; he apportions the school revenue to the several counties in

proportion to the number of youth from 6 to 18 years of age and of confederate soldiers under 30 years of age resident in each, and is required to make an annual report to the legislature. Each county constitutes a school district, under the control of a county board of education consisting of five freeholders, who are elected for four years by the grand jury. The board chooses a secretary for the same term, who is *ex officio* the county school commissioner, divides the county into subdistricts, and in each is required to establish one or more primary schools, and, where the public wants demand them, graded schools from the primary to the high school grade. The county boards have a general supervision of the schools and school houses of their counties, employing the teachers, and prescribing the text books, but no sectarian nor sectional books are to be used, nor can the Bible be excluded from the public schools. These boards constitute a tribunal for the determination of any local controversy respecting the construction and administration of the school laws, an appeal lying from their decisions to the state school commissioner, and are required to provide separate schools, with equal facilities, for white and colored children. The county school commissioner is the medium of communication between the state commissioner and the subordinate school officers; he is required to visit each school in his county at least twice a year, to make an annual census of the children of school age, to apportion the school fund of the county to the subdistricts in proportion to the number of such children in each, and to make such reports to the state commissioner as may be required. He examines teachers, who are licensed by the county board, and are divided into three grades, with licenses continuing one, two, and three years respectively. No county is entitled to its share of the state school fund unless the county board has provided by taxation or otherwise for keeping primary schools in operation for three months in the year, or two months in the case of ambulatory schools, which may be established in counties in which from sparseness of population it is impracticable to maintain schools for three months. The schools are free to the children of the respective school districts. The county boards may establish evening schools for youths over 12 years of age who cannot attend during the day, and under the direction of the state board they may organize self-sustaining manual labor schools. Public school buildings and furniture and the site (not more than four acres) of a public school house are exempt from taxation and from sale on execution. The school system of two cities and of four counties is organized under special laws. The school fund consists of the proceeds of the poll tax and of the taxes on shows and exhibitions, and on the sale of spirituous and malt liquors, one half of the monthly payments made by the lessees of the Western and Atlantic railroad, the dividends on 186

shares of the Georgia railroad and banking company, set apart as a permanent educational fund by the act of Jan. 22, 1852, and the interest (6 per cent.) on \$350,000 in bonds issued under the act of Dec. 11, 1858, as a permanent school fund. By an act of 1818 certain lands or the proceeds thereof were set apart for the education of poor children, but it is believed that but a small portion is now available. By the act of Feb. 19, 1878, it is provided that when legal bonds of the state are purchased and cancelled, or paid off, the same amount of bonds having 100 years to run shall be issued by the governor payable to the school fund, and that the interest on these at the rate of 7 per cent. per annum shall be paid semi-annually for the support of the public schools. From the adoption of the constitution of 1868 to Dec. 1, 1878, \$739,722 42 belonging to the school fund had been collected, of which \$354,418 89 had been diverted to other uses, but measures had recently been taken to restore it to the proper channel. The present school revenue is about \$250,000 a year. The state school commissioner in 1878 reported (two counties wanting) 849,164 children of school age, of whom 198,816 were white and 150,848 colored. Public schools were in operation in 120 counties; 89 reported 1,879 white and 356 colored schools; number of pupils enrolled, 76,157, of whom 58,499 were white and 17,658 colored; average attendance, 32,224. According to the United States census of 1870, the state contained 1,880 schools, having 2,482 teachers (1,517 male and 915 female), 66,150 pupils (32,775 male and 33,375 female), and an annual income of \$1,253,299, of which \$66,560 was derived from endowments, \$114,626 from taxation and public funds, and \$1,072,113 from other sources, including tuition fees. Of this number 246 were public schools, viz.: 4 normal, 9 high, 26 grammar, 18 graded common, and 189 ungraded common, having 327 teachers, 11,150 pupils, and an income of \$175,844, of which \$59,293 was derived from taxation. Of the schools not public, 151 were classical (28 colleges and 123 academies), 8 professional (1 law and 2 medical), and 9 technical (8 commercial, 1 for the blind, 1 for the deaf and dumb, and 4 of art and music). Of the residue, 1,452 were day and boarding schools and 19 parochial and charity schools. The colleges had 77 male and 56 female teachers, 978 male and 1,620 female pupils, and an income from endowments of \$36,850, and from other sources of \$112,516. The university of Georgia, at Athens, was chartered in 1795 and organized in 1801. It has a permanent endowment of \$100,000, derived from the sale of lands set apart in 1784 by the revolutionary statesmen and soldiers of Georgia, to found a university. The interest on this sum, which has been invested by the legislature, is paid by the state.¹ The university has a preparatory department, an academic department, embracing the ordinary branches of collegiate study, and a law department. The state college of

agriculture and the mechanic arts, endowed with the congressional land grant of 270,000 acres, which has been sold for \$243,000, was organized as a fourth department in 1872; it embraces instruction in agriculture, engineering, and chemistry. Students intending to enter the Christian ministry are relieved from payment of tuition when in need of aid, and other poor students, residents of the state, to the number of 50 annually, have their tuition remitted, in return for which they are expected to teach in some school in Georgia as many years as they have resided at the university. The number of professors and instructors in 1872 was 15, including 2 in the law and 8 in the preparatory department; number of students, 317, viz.: 7 resident graduates, 255 undergraduates (including 15 law students), and 55 in the preparatory department; number of volumes in the college and society libraries, 20,000. The North Georgia agricultural college, at Dahlonega, became toward the close of that year a branch of the state college and a department of the university. Atlanta university, in the city of that name, was established in 1867 by the freedmen's bureau and the American missionary association. It is not restricted as to color or sex, but is designed especially for the higher education of colored youth. Preparatory, normal, collegiate, agricultural, and theological departments have been organized, and in 1872 there were 7 instructors and 178 students. Oglethorpe university (Presbyterian), also at Atlanta, had 5 professors, 48 collegiate and 62 preparatory students; but it has since been suspended for want of funds. Mercer university (Baptist), at Macon, in 1871 had 5 professors and instructors, 82 students, and a library of 5,000 volumes. It has a theological department. Emory college (Methodist Episcopal church south), at Oxford, in 1872 had 12 professors and instructors, 50 preparatory and 189 collegiate students, and a library of 3,000 volumes. Bowdon college, at Bowdon, Carroll co., had 4 professors and instructors and 22 students. The other institutions classed as colleges are chiefly for the superior instruction of females. The principal are Furlow Masonic female college at Americus, Griffin female college at Griffin, Hamilton female college at Hamilton, the Southern female college at La Grange, the Wesleyan female college at Macon, the Georgia female college at Madison, Marietta female college at Marietta, La Vert female college at Talbotton, West Point female college at West Point, and Monroe female college at Forsyth. The Atlanta medical college in 1872 had 14 professors and instructors and 52 students. The medical college of Georgia, at Augusta, had 10 professors and instructors, 108 students, and a library of 5,000 volumes. The Savannah medical college in 1872 had 14 professors and instructors, 36 students, and a library of 3,000 volumes. The census of 1870 returns 1,735 libraries, containing 467,232 vol-

umes, of which 545, having 162,851 volumes, were not private, classified as follows: state, 1, with 16,000 volumes; town, city, &c., 4, with 3,780; court and law, 63, with 8,610; school, college, &c., 15, with 41,100; Sabbath school, 369, with 63,114; church, 82, with 16,002; historical, literary, and scientific societies, 2, with 2,000; benevolent and secret associations, 1, with 400; circulating, 8, with 11,895. Besides the college libraries, the principal are those of the young men's library association at Atlanta (3,000 volumes), of the mechanics' and scientific association at Columbus (8,000), and of the Georgia historical society at Savannah (7,000). There were 110 newspapers and periodicals, issuing 15,589,724 copies annually, and having an average circulation of 150,987, viz.: 15 daily, circulation 80,800; 5 tri-weekly, 3,600; 9 semi-weekly, 5,100; 78 weekly, 88,837; 2 semi-monthly, 700; and 6 monthly, 21,950. They were classified as follows: agricultural and horticultural, 6; illustrated, literary, and miscellaneous, 5; political, 98; religious, 4; technical and professional, 2. The number of church organizations was 2,878. The number of edifices and sittings, and the value of church property, are shown in the following table:

DENOMINATIONS.	Edifices.	Sittings.	Property.
Baptist	1,312	389,165	\$1,125,650
Christian	88	10,235	60,050
Congregational	10	2,800	16,550
Episcopal	27	10,080	307,200
Jewish	5	1,400	52,700
Lutheran	10	8,000	57,100
Methodist	1,158	327,348	1,073,080
Presbyterian	123	46,575	559,525
Roman Catholic	11	5,500	294,650
Universalist	3	900	900
Union	6	1,100	20,700
Total	2,698	801,148	\$3,561,935

—Of the thirteen provinces which declared themselves independent in 1776, Georgia was the latest settled. The country lying within its present boundaries was a wilderness previous to 1733, and, though comprehended within the charter of Carolina, had been claimed by Spain as well as England. By patent dated June 9, 1732, George II., in honor of whom it received its name, granted the territory to a corporation entitled the "Trustees for settling the Colony of Georgia." The double purpose proposed in the settlement of this region was, on the one hand, to afford a retreat for the destitute at home, and on the other, to secure the frontiers of the Carolinas from the incursions of the Indians and the Spaniards of Florida. In November of the same year 116 persons were embarked at Gravesend under the direction of Gen. James Oglethorpe, and arrived at Charleston in January, 1733. From this place Oglethorpe explored the country, and soon after purchased a large tract of land from the Creeks. On a high bluff overlooking a river the foundation of a town was laid,

which received the name of Savannah. Here the settlement was commenced in the spring of 1733. The condition upon which the lands were parcelled out was military duty, and so grievous were the restrictions to which the colonists had to submit that many returned into Carolina, where the lands were held in fee simple. The number of inhabitants in the colony nevertheless continued to increase, considerable accessions to its population being received from Germany and Scotland. In 1739 war broke out between Spain and England, and Gen. Oglethorpe was appointed to the command of the South Carolina and Georgia troops. Having mustered 1,000 men and a number of Indian allies, he invaded Florida, but, failing in an expedition against St. Augustine, returned unsuccessful. In 1742 this invasion was retaliated, and a Spanish fleet of 86 ships and 5,000 men appeared in the Altamaha river, took Fort St. Simon, and were proceeding against Fort Frederica, on St. Simon's island, when from a stratagem conceived by Oglethorpe they became alarmed, retired to their ships, and sailed for Florida. Peace was soon restored; but restrictions of various kinds, and especially the prohibition of slavery, rendered the people discontented, and many abandoned their settlements, while those who remained with difficulty obtained a scanty subsistence. The restrictions upon slavery were removed about 1750, and in 1752, the trustees having surrendered their charter to the crown, Georgia became a royal government, with privileges and regulations similar to those of the other colonies. The first good effect of the change of government was felt in the establishment of a general assembly in 1755. The limits of the colony to this time were the Savannah on the north and the Altamaha on the south, extending westward to the Pacific. In 1763 all the lands between the Altamaha and St. Mary's were annexed to Georgia by a royal proclamation. From this period the colony made rapid progress; the rich swamps and lowlands on the rivers were brought into cultivation, and production rapidly increased. At the commencement of the revolution the colonists did not hesitate to make the grievances of their northern brethren their own, and take part in the coming struggle. In July, 1775, a convention gave the sanction of the colony to the measures of congress, and appointed delegates to that body. During the war that ensued Georgia was overrun by British troops, and the principal inhabitants were compelled to abandon their homes and fly into the neighboring states. In 1778 Savannah was captured, and in 1779 Augusta and Sunbury. In the latter year an unsuccessful attempt was made by the Americans and French to recapture Savannah. Georgia framed its first constitution in 1777, a second in 1789, and a third in 1798, which was several times amended. The constitution of the United States was ratified by Georgia on Jan. 2, 1788. After

the revolutionary war Georgia suffered on her frontiers from the incursions of the Creeks and Cherokees. In 1790 and 1791 treaties were concluded with the chiefs of those nations. By the treaty of Fort Wilkinson in 1802 the Creeks ceded to the United States a large tract which has since been assigned to Georgia, and now forms the S. W. counties of the state. In the same year Georgia ceded to the United States all its claims to the lands westward of its present limits. Subsequently serious difficulty arose between the state and national governments respecting the Cherokees, which was terminated by the removal of that tribe in 1838 to the Indian territory, when Georgia came into possession of their lands. In the presidential election of 1860 the vote of Georgia was 51,889 for Breckenridge, 42,886 for Bell, and 11,590 for Douglas. Immediately after the result became known the legislature (Nov. 18) ordered an election to be held on Jan. 4, 1861, for the choice of delegates to a convention to consider the question of withdrawing from the Union. This convention, consisting of 801 delegates, assembled at Milledgeville on Jan. 16, and on the 19th passed an ordinance of secession by a vote of 208 to 89. A proposition to call a congress of the disaffected states, with a view to cooperation, was defeated by a vote of 164 to 188. All the delegates subsequently signed the ordinance except six, who caused an entry to be made in the journal that they acquiesced in the will of the majority. On the 24th 10 delegates were appointed to the congress of the seceded states, to be held at Montgomery, Ala., Feb. 4, and on March 16 the constitution of the Confederate States was unanimously ratified. Ordinances were also passed resuming jurisdiction over places ceded to the United States, and transferring all forts, arsenals, and munitions of war to the confederate government. On Jan. 8, 1861, Fort Pulaski, on Cockspar island at the mouth of the Savannah river, mounting 60 guns, was seized by order of Gov. Brown, and at the same time Fort Jackson, 4 m. below Savannah, was occupied. On the 24th the arsenal at Augusta, containing two 12-pound howitzers, two cannon, about 20,000 small arms, and large stores of ammunition, was taken possession of by 700 state troops under Gov. Brown. Georgia, except on the coast, was not the theatre of active hostilities until 1864. On Nov. 25, 1861, Com. Du Pont, who had just taken Port Royal, S. C., occupied Big Tybee island at the mouth of the Savannah, and soon after other points commanding Fort Pulaski were taken possession of, and that fort was reduced, April 11, 1862, by a bombardment from batteries erected on Tybee island. Early in March Com. Du Pont, with a fleet from Port Royal, took possession of St. Mary's, Brunswick, Darien, and St. Simon's island, and left a small force at each. On Feb. 28, 1863, the Nashville, a confederate ironclad, was destroyed in the Ogeechee river by Commander Worden; and on March 8 an

ineffectual attack was made on Fort McAllister on the same river, a few miles S. W. of Savannah, by a federal fleet. On June 11 Darien was burnt, and on June 17 Capt. John Rodgers in the Weehawken disabled and captured in Warsaw sound the confederate ironclad Atlanta, which had just come down from Savannah. A portion of the operations around Chattanooga in the autumn of 1863 took place in N. W. Georgia. On May 6, 1864, commenced the decisive campaign from Chattanooga under Gen. Sherman, which resulted, after a persistent resistance and much severe fighting, in the evacuation of Atlanta by the confederates on Sept. 1. Sherman started, Nov. 15, on his memorable march to the sea. Passing through the heart of Georgia, he entered Milledgeville on the 23d, and reached the vicinity of Savannah on Dec. 10. On the 13th Fort McAllister was taken by storm, and on the 21st Savannah was occupied, having been evacuated the night before by the confederates under Gen. Hardee, who had destroyed the navy yard, two ironclads, several smaller vessels, and much ammunition and stores. A cavalry force under Gen. Wilson in April, 1865, entered Georgia from Alabama, took Columbus and West Point, arrived at Macon on the 21st, and captured Jefferson Davis, the fugitive president of the confederacy, at Irwinville, May 10. Andersonville in this state was the seat of the most noted of the confederate military prisons, and there was another at Millen, which was removed upon the approach of Gen. Sherman. After the surrender of the confederate armies, the state was under the control of the military until June 17, 1865, when President Johnson appointed James Johnson, a citizen of the state, provisional governor, with power to call a convention of delegates chosen by the citizens loyal to the United States, who were qualified as voters by the laws in force immediately before the passage of the ordinance of secession, and who should take the oath prescribed in the amnesty proclamation of May 29. The election of delegates took place Oct. 4, and the convention, assembling at Milledgeville on the 25th, remained in session 13 days, during which time it repealed the ordinance of secession and acts in pursuance thereof, declared the war debt void, amended the constitution by abolishing slavery and in other respects, and ordered an election to be held on Nov. 15 for governor, members of the legislature, and congressmen. The legislature convened Dec. 4, and soon afterward ratified the amendment to the constitution of the United States abolishing slavery, by a unanimous vote. On the 14th Charles J. Jenkins, who had been elected governor, was inaugurated, and on the 19th the provisional governor was instructed to turn over to him the government of the state. These measures not meeting with the approval of congress, the senators and representatives were not admitted to seats; and under the reconstruction acts of 1867 Georgia, with Alabama

and Florida, was constituted the third military division, and placed in command of Major Gen. Pope. A registration of those entitled to vote under these acts was subsequently made, when 192,235 voters were registered, viz.: 96,262 white and 95,973 colored. An election was held during the five days commencing Oct. 29, which resulted in a large majority for a constitutional convention (the whites generally refraining from voting), and in the choice of 166 delegates, of whom 83 were colored. The convention met at Atlanta Dec. 9, and adjourned finally March 11, 1868, after framing a constitution, and providing for an election for its ratification or rejection and for the choice of state officers and congressmen, to be held April 20 and the three following days. The result was a majority of 17,699 for ratification, and the election of Rufus B. Bullock, republican, by 7,047 majority over John B. Gordon, democrat. The legislature consisted of 22 republicans and 22 democrats in the senate, and 73 republicans and 102 democrats in the house; 3 senators and 25 representatives were colored. On June 25 an act of congress was passed providing for the readmission of Georgia, with other states, upon the ratification by the legislature of the 14th amendment to the constitution of the United States, and the abrogation of certain provisions of the state constitution prohibiting suits on debts contracted prior to June 1, 1865. The legislature organized on July 4, and on the 21st complied with the prescribed conditions by a vote of 24 to 14 in the senate and 89 to 70 in the house, and on the following day Gov. Bullock was inaugurated. On the 29th United States senators were elected, and on the 30th the government of the state was turned over to the civil authorities. The congressional representatives had been admitted to seats on the 25th, but the senators were still excluded. In September the colored members of the legislature were expelled, and the candidates having the next highest number of votes in the respective districts seated in their places, on the ground that by the code and the laws existing at the adoption of the constitution, which were continued in force by one of its provisions, negroes were ineligible to office. This action was regarded by the majority at Washington as a violation of the reconstruction acts and of the conditions upon which the state had been admitted; and on the organization of the 41st congress, March 4, 1869, the representatives from Georgia were not permitted to take their seats. Subsequently the supreme court of the state decided that negroes were entitled to hold office, and on Dec. 22 congress passed an act directing the governor by proclamation to convene at Atlanta all persons declared by the order of Gen. Meade (who had succeeded Gen. Pope in December, 1867) of June 25, 1868, to be elected to the legislature, who were required to take the test oath prescribed by the act as a condition precedent to organization, and to ratify the 15th amend-

ment to the constitution of the United States, to entitle the state to representation in congress. By an order of Dec. 24 Major Gen. Terry was placed in command of the troops to carry the act into effect. The legislature met, Jan. 10, 1870, in pursuance of a proclamation of Gov. Bullock, and adjourned from time to time until the 26th of that month, when a commission appointed by Gen. Terry to determine the eligibility of certain members reported against 21 as ineligible under the 14th amendment, or for refusing to take the test oath, and the candidates having the next highest number of votes in the respective districts were seated in their places. Both houses were declared duly organized on the 31st, and on Feb. 2 the 15th amendment was ratified by a vote of 26 to 10 in the senate and 55 to 29 in the house. The conditions prescribed in the reconstruction acts of 1867 were also assented to, and subsequently United States senators were elected. On July 15 an act for the readmission of the state received the approval of the president. An election for congressmen was held Nov. 20-22, and they, together with the senators elected in 1868, having been admitted to congress in the following December, the reconstruction became complete. (See supplement.)

GEORGIA (Russ. *Grusia*; Pers. *Gurjistan*; anc. *Iberia*), the name formerly applied to that part of western Asia comprised in the Russian Transcaucasia, lying between the Caspian and the Black seas, and the Caucasian and Armenian mountains; area, about 70,000 sq. m. Within its boundaries are included the Russian governments of Kutais, Tiflis, Elisabethpol, Baku, and Erivan, and the districts of Sakatal, Sukhum, and Tchernomore. These are the extreme limits of ancient Georgia, but in modern times the name has generally been confined to the territory bounded N. by the Caucasus, E. by Shirvan, S. by the range of the Armenian mountains separating the valley of the Kur from that of the Aras, and W. by a branch of the Caucasian range, having an area of about 25,000 sq. m. The surface of the entire country is mountainous, but many of the valleys, especially that of the river Kur, which flows through it from W. to E., are of great fertility. The climate is agreeable and healthful, and the soil produces in abundance all the cereals, hemp, flax, and cotton, and many fine fruits, particularly grapes, from which much wine is made. For a more particular description of the country see **Russia** and the articles on the modern governments and districts.—The Georgians, or ancient Iberians, including their kindred, the Suanethians, Mingrelians, and Lazians, form the main race of the southern division of the Caucasian group of the Mediterranean family of the human species. Their name is believed to be derived from the Persian *gurj* (*Gurjistan*, "the land of wolves"). They call themselves Kartveli or Kartlians, after the province Kartlia of the former Georgian empire. The Armenians call them Virk.

The Georgians proper occupy the country comprised within the more limited of the boundaries above given, and embracing Kartlia on the Kur, Kakhetia, N. E. of Kartlia, and other districts. West of them are the Mingrelians, who occupy Mingrelia, and Guria, on the Black sea. The Suanethians inhabit the southern slope of the Caucasus N. E. of the Mingrelians. These three divisions belong to the Russian empire. The Lazians in the sanjakate of Lazistan, pashalik of Trebizond, are subjects of Turkey. While the Armenians, who control most of the traffic of the country, are timid and intent on gain, the Georgians are bold, reckless, turbulent, and extravagant. They are also indolent, apathetic, and ignorant, seldom giving any signs of animation except when on a drinking bout. The lower classes are chiefly cultivators of the soil, which they work in the same way that their ancestors did centuries

Georgian Costumes.

ago. The Georgian men are noted for their athletic forms and the women for their beauty, although the features of the latter are regular and handsome rather than beautiful, and are wanting in expression. The general characteristics of the race are finely chiselled brows, large, black, liquid eyes, prominent semi-aquiline nose, and voluptuous mouth. Before marriage the women endeavor to keep their waists as small as possible by means of a girdle, which they wear almost continuously; this results in a large development of the bosom, which is much admired. It is said that in former times the belt was never removed until the nuptial day, when it was cut by the dagger of the bridegroom. Many such ancient customs, now obsolete in the neighborhood of Tiflis, are still preserved in the mountains and isolated districts. Before the Russian domination a large

trade in slaves was carried on with Turkey, the Georgian nobles deriving their chief revenue from the sale of their serfs, the men for the Turkish armies, the women for the harems; but the traffic is now interdicted, and the relations between the upper and lower classes are much modified. The Persians and Mussulmans from the north of India also purchased many women from this region for their harems, paying sometimes as high as 20,000 piastres for a remarkably beautiful one. The Georgian stock consequently is largely disseminated throughout Mohammedan countries. The Georgians are nominally members of the Greek church, and have had the Bible in their language since the beginning of the 10th century; but the priests are generally as ignorant as the people.—Nothing certain is known of early Georgian history. The statements of the Greek and Latin writers are confused and lead to various conclusions. George Rawlinson thinks that the territory was anciently "in the possession of a people called by Herodotus Saspeires or Sapeires, whom we may identify with the Iberians of later writers." The Colchians and Albanians were probably their neighbors. Their legends trace their origin to Targamos, a descendant of Japhet, and claim Mtkhetos as the founder of the ancient capital Mtkhta, which stood about 15 m. N. W. of Tiflis. The first Georgian empire seems to have been ended by the Scythians, who invaded it in the 7th century B. C. It is probable that it afterward formed a part of the Persian empire, was conquered by Alexander the Great, and regained its independence at his death. Pharnavas was the first or one of the first kings of the second Georgian empire. Mirvan, in the latter part of the 2d century B. C., and his son Pharnaj, sovereigns of Persian descent, introduced Parseeism, which led to a revolt. The king of Armenia came to the aid of the Georgians, and put his son Arshag on the throne, thus founding the dynasty of the Arsacides. In 65 B. C. the Georgians or Iberians came into contact with the Romans, and were compelled by Pompey to sue for peace. In the beginning of the 8d century A. D. the kingdom became highly prosperous, but in the following period the Persians made destructive invasions. Early in the 4th century the Georgians were converted to Christianity by St. Nina, a captive woman. At the death of Stephanos I. in 574, Guram, a Jew who had been his general-in-chief, ascended the throne. In 635 the Arabs overran the country, but did not succeed in subverting Christianity. Subsequent kings suffered much from their aggressions, and the Armenian dynasty of the Bagratides, who succeeded the Guramides, eventually became vassals of the caliphs. Bagrat III. liberated his country from foreign domination, and David III. (1089–1126) extended his dominions over a part of Armenia and as far as Trebizond. Queen Tamar III. (1184–1206) reduced several of the tribes north of

the Caucasus, and her son George IV. vanquished the Persians, converted many of them to Christianity, and rendered valuable aid to the crusaders. In the 18th century the Mongolians subdued the country, but in the middle of the 14th George VI. threw off their yoke and extended his sway over the neighboring provinces. Tamerlane reduced the country to subjection, but it was again liberated by George VII. In 1424 King Alexander divided his kingdom among his three sons, and the history of the next two centuries is one of conflicts between the three governments, and of quarrels with Persia and Turkey, in which Russia interfered. The country was reunited under Vakhtang IV. or V., whom the Persians call Shah Naos. He died in 1676, and for a century after Georgia was the scene of intestine feuds and divisions, in which the Turks and Persians took part. In 1788 Irakli (Heraclius) II. of Kakhetia, who had united under his sway a large part of the ancient kingdom, being pressed by the Persians, announced himself a vassal of Russia. His successors having new difficulties with the Persians and Leaghians, Georgia was made in 1801 a province of Russia, and in 1810 Imerechia was added to it.—The Georgian language is written in an alphabet of 40 letters, somewhat varying in different manuscripts. The following are used in Brosset's dictionary:

ს A	ბ B	გ G	დ D
ე E	ვ W	ზ Z	ჲ H
თ TH	ი I	ო O	ლ L
მ M	ნ N	ი I	ო O
პ P	ჟ J	რ R	ს S
ტ T	უ U	ჳ VI	ფ P
კ K	ღ GH	ყ Q	შ OH
ჩ CH	ც TZ	ძ DZ	წ TS
ჯ DCH	ხ KH	ჭ KHH	ძ DJ
ჴ H	ჶ HO	ფ F	ჲ E

The characters used in the ecclesiastical style of writing differ from the common ones. The languages of the four tribes, the Georgians, the Mingrelians, the Suanethians, and the Lazians, are related to each other, and show a common development from one primitive form, either primitive Aryan or Dravidian; but there is no foundation for connecting them with the languages spoken by tribes north of the Caucasus. The Georgian is written from left to right. It makes no distinction of gender. To distinguish sex, the words male and female are introduced, except for the words king, queen, young man, young woman, him, and her. No article is used. There are two numbers, singular and plural, and six cases, nominative, genitive, dative, vocative, instrumental, and instrumental modal. There are special forms for the comparative and superlative of adjectives. Nouns are inflected by means of suffixes, and verbs by means of suffixes, prefixes, and changes in the radical letters. The verbs are either active, passive, reciprocal, or neuter, and are modified according to one of the 20 classes of conjuga-

tion into which they are divided. Prepositions govern either the genitive, dative, or instrumental.—Among the literary remains of ancient Georgia, some of the manuscripts written in the ecclesiastical style of alphabet are probably of high antiquity; but most of them date subsequently to the introduction of Christianity, and consist of homilies and translations of portions of Scriptures, and of Plato, Aristotle, and other Greek authors. Some manuscripts contain novels and romances; one gives in verse the history of Shah Naos, and several, dating principally from the 17th century, are poetical works of some merit. The most important of Georgian manuscripts are: a volume of 63 treatises, historical and biographical, which has thrown much light on the history of the Khazars during the 8th century; a translation of the Gospels by Droudeh, dating from the 10th century; and a romance entitled "Tariel, the Man with the Tiger Skin," a general of Queen Tamar, by Skhotta of Rustvel. The following is a facsimile of the last verse of Rustvel's romance:

ღმირან ზარეჯანისდე ჯოსეს თქიან ღონელს.
 ღმრთულ-ჯესიან შავთელს ლე ქსი მას თქეს რო-მელს.
 ზილან-ღოს სარგის ღმრგელს, მას ენა დანდრო-
 მელს. და ღმრთულ მილსა ჯუტსუკელს. მის-თვს
 ცრემლ-მეტ შრ-მელის.

The literal translation is as follows: "Moses of Khoris has glorified Amiran, the son of Daredjan; the poem of Abdul Messia, written by Khertel, and the history of Dilar by the indefatigable writer Geth Sargis of Tmogvi, were worthy of praise; but Rustvel has wept without ceasing over his Tariel." Among similar compositions, an epic on Queen Tamar, by Tchakhadze, ranks equally high. During the 18th century, in spite of the incessant wars that harassed the country, there was a rich supply of meritorious literature, and the language attained that definiteness, richness, and energy which are now its most prominent features. Prince Sul Khan-Saba-Orbelian published in that century a dictionary of the language, containing at least 25,000 words, and King Vakhtang VI. caused an extensive history of the country to be written. The Russian language has now generally superseded the Georgian in the schools, and books in the Georgian language are printed in Russian characters. The language and literature of the Georgians have been specially studied by Adeling, Brosset, Dorn, Josselin, Klaproth, Saint-Martin, and Tohubinoff. Brosset is considered the highest authority on the subject. Ethno-

logical studies of the Georgian race are contained in the books of travel of Cunyngname, Dorn, Dubois de Montpéroux, W. J. Hamilton, Haxthausen, Mounsey, Poulett-Cameron, and Wagner.—See *Histoire de la Géorgie depuis l'antiquité jusqu'au XIX^e siècle, traduite du géorgien*, by Brosset (3 vols. 4to, St. Petersburg, 1849-'57); "History of Grusia," by Baratoff (St. Petersburg, 1865 *et seq.*); and *La Géorgie*, by De Villeneuve (Paris, 1871).

GEORGIA, Gulf of, an arm of the sea lying between Vancouver island and the mainland of British Columbia, between lat. 48° 50' and 50° N., and lon. 122° 40' and 125° W. On the south it is connected with the strait of Juan de Fuca by Haro and Rosario straits, and on the north with Queen Charlotte sound. Howe sound and Jervis and Burrard inlets run from it into the mainland. Fraser river flows into it. Its length is about 100 m.; greatest breadth, 30 m. At each extremity of the gulf is an archipelago, and it contains several large islands.

GEORGIA BARK, the common name of *Pinckneya pubens*, one of the handsomest of our native shrubs. It grows in bogs and along the banks of streams from South Carolina to Florida, and sometimes attains the height of 20 ft.,

though, as it throws up many stems from the same root, it retains a shrub-like form. It has the general botanical characters of the *rubiacææ*, to which family it belongs. The leaves are large, oval, acute, and downy on the under surface, as are the flower clusters which are borne at the ends of the branches; these consist of several five-flowered fascicles of purplish-spotted flowers, with a tube nearly an inch long and a reflexed limb; the calyx is short and five-lobed, one of the lobes being expanded into a large, ovate, rose-colored leaf, which is more showy than the flower itself. The plant is closely related to *cinchona*, and is one of the many that have been proposed as substitutes for Peruvian bark. From the reports of physicians living in the states where it grows, it appears to have decided anti-periodic properties, though slower in its action than quinia. As an ornamental plant it is deserving of the attention of those who live in a climate where the winters are mild; in England it is sufficiently valued to be cultivated as a wall plant. The genus was named by Michaux in honor of Gen. Charles C. Pinckney.

GEORGIAN BAY. See **HURON, LAKE.**

GEPIDÆ, a Germanic people, akin to the Goths, who first appear in history in the 3d century A. C. as living on the Baltic near the Vistula. They subsequently moved further S. and settled N. of Pannonia, between the Ostrogoths on the east and the Visigoths on the west. They were at first compelled to follow Attila, but regaining their independence at his death, under their king Arderic, they drove back the Huns and occupied their territory on the lower banks of the Theiss, Danube, Drave, and Save. Theodoric, king of the Ostrogoths, defeated them in 488 near Sirmium (now Szerém in Slavonia), and Alboin, king of the Lombards, assisted by the Avars, destroyed their power in 566. The remnants of the people became gradually amalgamated with the conquerors.

GERA, a town in the German principality of Reuss-Schleiz, in a beautiful valley on the right bank of the White Elster, 35 m. S. S. W. of Leipsic; pop. in 1871, 17,959. It consists of the town proper and two suburbs, and is regularly built, having been restored in modern style after a great conflagration in 1780. It has manufactories of woollens, cotton, linen, camlet, porcelain, stoneware, tobacco, leather, soap, chocolate, glue, artificial flowers, musical instruments, and fire engines, iron foundries, large breweries and dyeing establishments, and carries on a considerable trade. Its old castle dates from 1086, when the place first became a town, and was bestowed on the baron of Reuss in the 12th century. Three railways connect the town with Zeitz, Gössnitz, and Eichicht.

GERAMB, Ferdinand de, baron, a French Trappist, born in Lyons, April 17, 1772, died in Rome, March 15, 1848. He was educated in Vienna, and served against the French in the Austrian, Spanish, and English armies. He was of a violent temper, and fought several duels. In 1812

he was in London, and his creditors sought to have him arrested, but he barricaded his dwelling, hung out a flag inscribed "My house is my castle," and resisted for a fortnight the sheriff and his deputies. He was afterward sent to the continent, where he fell into the hands of Napoleon, by whose orders he was imprisoned in Vincennes and afterward in La Force. In the latter prison he met the bishop of Troyes, and thenceforward he consecrated his life to religion, joining the Trappist order some time after his release (1815). He took the vows in 1817 at the monastery of Port du Salut near Laval, and distinguished himself so greatly by his piety that he was appointed procurator general of the order. In 1831 he made a pilgrimage to the Holy Land, and in 1837 went to Rome. His *Pèlerinage à Jérusalem et au mont Sinai en 1831-'33* (4 vols., Paris, 1836) has been translated into foreign languages, and passed, like his *Voyage de la Trappe à Rome* (1838), and other works, through many editions.

GÉRANDO, Joseph Marie de, baron, a French philosopher and statesman, born in Lyons, Feb. 29, 1772, died in Paris, Nov. 11, 1842. He was educated in the college of the Oratory at Lyons, and was preparing for the priesthood against the wishes of his family when the revolutionary persecutions of ecclesiastics led him to change his purpose. When in 1793 his native town was besieged by the troops of the convention, he took arms for its defence, was made prisoner, and narrowly escaped death. He entered the army, but his regiment having been sent to Lyons, he was there recognized, denounced, and obliged to seek safety in flight. He went to Switzerland and thence to Italy, and was employed two years in a commercial house in Naples. In 1797 he returned to France, afterward joined a regiment of cavalry, and was in garrison at Colmar when the institute proposed the question: "What is the influence of signs on the formation of ideas?" De Gérando sent in a dissertation on it, and learned that he had received the prize soon after the battle of Zürich, in which he had taken part. Invited to Paris, he entered the ministry of the interior under Lucien Bonaparte in 1799, became secretary general of that department under Champagny in 1804, accompanied him to Italy in 1805, was appointed master of requests in 1808, was afterward engaged in the organization of Tuscany and of the Papal States when they were united to France, received the title of councillor of state in 1811, and was appointed governor of Catalonia in 1812. On the fall of the empire he retained his dignities; but for having been sent to organize the defence of the Moselle during the hundred days he was at first discarded after the second restoration, but soon resumed his place in the council of state, which he held during the rest of his life. In 1819 he began a course of lectures before the faculty of law in Paris on public and administrative law, which were

suspended in 1822 and resumed in 1828. In 1837 he was raised to the peerage. His principal philosophical works are: *Des signes et de l'art de penser considérés dans leurs rapports mutuels* (4 vols. 8vo, Paris, 1800); *De la génération des connaissances humaines* (Berlin, 1802); and *Histoire comparée des systèmes de philosophie* (8 vols. 8vo, Paris, 1808), of which a posthumous volume appeared in the third edition (1847-'8). In 1825 he received the prize of the academy for his treatise *Du perfectionnement moral et de l'éducation de soi-même* (translated into English, Boston, 1830), the fundamental idea of which is that life is a discipline whose object is perfection. The five leading motives which solicit the will are sensations, affections, thought, duty, and religion; and the two conditions of harmonious development are a love of the good (*l'amour du bien*) and a habit of self-control. His *Visitateur du pauvre* also received the prize of the academy (1821). In 1827 he published *De l'éducation des sourds-muets de naissance*; and in 1829 appeared his *Institutes du droit administratif français*, which was finished by Boulatignier and Alfred Blanche (2d ed., 5 vols., 1842-'5). Shortly before his death he made a tour through Germany and Switzerland, in order to study the system of hospitals and other charitable institutions.

GERANIUM (Gr. γέρανος, a crane), the botanical name of one genus and the popular name of another genus of plants belonging to the family *geraniaceae*. Plants of the genus *geranium* are herbs with perennial, biennial, or annual roots; stems swollen at the joints; leaves usually rounded and palmately lobed or dissected; flower stalks terminal or lateral, one- to three-flowered; flowers symmetrical, parts in fives, petals equal; stamens ten, in two series, the five outer ones opposite the petals and sterile; alternating with the petals are five small glands upon the receptacle; the pistil consists of five two-ovuled carpels united to a prolongation of the axis. As the pistil matures this axis and the attached styles elongate and form a pointed fruit about an inch and a half long; the beak-like character of the fruit suggested the popular name of cranesbill, and probably the botanical name for the genus also. When quite ripe the carpels break away from the central axis, the small one-seeded pods remaining attached to the styles, the separation taking place from below upward. Six species of *geranium* or cranesbill are found east of the Mississippi, and a few others are peculiar to the western side of our territory. The only perennial among the eastern species, and at the same time the largest and best known, is *G. maculatum*, the spotted cranesbill; its stem is about two feet high, each of its numerous branches bearing two light purple flowers about an inch across; the leaves are about five-parted, with the divisions cut at the ends; when old they sometimes have whitish blotches, on account of which not very conspicuous character the

specific name was given. The root stock of this plant is very astringent, and is not only a popular domestic remedy in diseases of the bowels and other cases where astringents are required, but is officinal in the United States pharmacopœia. On account of its astringen-

Spotted Cranesbill (*Geranium maculatum*).

cy it is in some places called alum-root, a name which properly belongs to *Heuchera*, and should be restricted to it. Of the annual kinds we have *G. Robertianum*, or herb Robert, a beautiful plant common in our woods, especially among rocks and in the rich black mould of their crevices, where it is partially shaded. Its flowers, though small, are numerous and

Herb Robert (*Geranium Robertianum*).

prettily striped and rosy, and its foliage is so delicately cut and borne upon long slender petioles, that it is well adapted for the garden, especially in the rockwork. A heavy disagreeable odor is however emitted from its leaves, if handled. Frequently in the autumn

the leaves are curiously dotted with minute black specks, the perithecia of a parasitic fungus (*dothidea Robertianum*). *G. Carolinianum*, similar, with paler flowers and scentless foliage, erroneously supposed to be *G. dissectum*, occurs in waste places on barren soils, and is widely diffused. *G. pusillum* (small-flowered cranesbill), with slender stems, rounded, five-parted, kidney-formed leaves, and small bluish-purple petals, has been found in waste places in New York and Massachusetts. The last three are natives of Europe, naturalized in this country. Some exotic perennial species are cultivated in our gardens; the commonest of these is *G. sanguineum*, a native of England, with deep crimson-purple flowers which bloom nearly all summer; a variety of this is known as *G. Lancastriense*. *G. Ibericum*, *G. pratense*, and a few others are also grown. The anemone-leaved geranium, *G. anemonefolium*, is a greenhouse species, with beautifully divided leaves, from the Cape of Good Hope.—Geranium is the name popularly given to the species and varieties of *pelargonium*, so generally cultivated. The genus *pelargonium* differs from *geranium* in several characters, the most obvious of which are the half-shrubby character of the stems and the somewhat irregular flowers. One of the sepals or divisions of the calyx has its base prolonged, which runs down on one side of the pedicle or flower stalk as an adherent spur, as may be seen in a cross section of the pedicle; the two petals nearest this sepal are often different from the others in size and shape; stamens that bear anthers usually seven, always less than ten; pistil as in *geranium*. The name, as with *geranium*, is suggested by the fancied resemblance of the fruit to the bill of a bird, but in this case it is the stork in place of the crane (Gr. *πτελαργός*, a stork). There are no more popular tender plants than the various *pelargoniums*, whether for window culture, summer bedding plants, or choice ornaments to the conservatory and greenhouse. Though the name *geranium* applied to them is incorrect, it has become so firmly attached by long usage that no change is probable. As with many other plants that have been long in cultivation, the *pelargoniums* have become so mixed by hybridizing, crossing, and sporting, that it is generally difficult to determine the species from which they originated. The Cape of Good Hope has furnished a large majority of the species, a few only having come from Australia and elsewhere. A scientific classification being impracticable, it will serve our purpose to group them after the manner of the florist. The scented *pelargoniums* include a number that have fragrant foliage and generally inconspicuous flowers. The best known is the rose geranium, *P. capitatum*, which is probably the oldest species in cultivation, it having been carried to England in 1690; its lobed, downy, pleasantly scented leaves are well known; there is a variety with the leaves edged with white. The peppermint geranium is *P. tomentosum*; the nutmeg-scent-

ed, *P. odoratissimum*; and the pennyroyal-scented, *P. exaltatum*. The ivy-leaved *pelargoniums* form a very distinct group, distinguished by their smooth, fleshy leaves, lobed like those of the ivy, and their weak and trailing stems; they are mainly derived from *P. peltatum* and *P. lateripes*. Within a few years great improvement has been made in this class, and they now present a great variety in foliage and flowers; their prostrate habit especially adapts them to cultivation in vases and hanging baskets. Florists' *pelargoniums*, or show *pelargoniums* as they are often called, have rounded leaves and flowers, often somewhat irregular, of the greatest beauty of color and markings; they have resulted from long-continued crossings, and their origin is so obscure that recent French writers name them all *P. hortulanorum*, the *pelargonium* of the gardeners. This class is only seen in perfection in greenhouses, and it requires great care

Scarlet Geranium (*Pelargonium inquinans*).

and skill to make a fine show of them. We then have a large class that flower indoors in winter, and are turned out into the borders in summer, where they are used in masses to produce fine effects by their flowers or foliage; the foliage of these has an unpleasant odor, and some of them are popularly known as fish geraniums. The old scarlet geranium, *P. inquinans*, and the horseshoe geranium, *P. zonale*, are the principal species from which this class originated; the flowers range from white to the most dazzling scarlet and dark crimson; of late a number with double flowers have been introduced; their foliage is often highly ornamental, it being variegated with white, yellow, pink, and other shades upon the green. The florists do not agree in their classification of these varieties; their principal divisions are into nosegay, zonale, bronze-zoned, gold and silver

tricolors, and gold and silver margined. Some of the tricolors, of which "Mrs. Pollock" may be taken as the type, have leaves beautifully colored; but these do not flourish well in our hot summers, and are only seen in perfection when grown under glass. Pelargoniums grow

Horseshoe Geranium (*Pelargonium zonale*).

readily from seed, and if started early in a hotbed the plants may be had in bloom the same season; the plants have such a mixed and varied ancestry that seeds from almost any of our cultivated kinds are likely to produce plants different from the immediate parent.



Pin Grass (*Erodium cicutarium*).

Those who engage in the production of new varieties practise careful crossing, using the pollen of one variety upon the pistil of another in the usual way. The varieties are perpetuated by propagating from cuttings, which readily take root; the commercial florists propagate them

all winter for the spring sales; the amateur can readily multiply them in the open ground after the hot weather of summer is over. Cuttings two to six inches long, planted in a shady place, will soon take root and make good plants for winter blooming; if the stems from which the cuttings are to be taken are very succulent, they should be cut half or two thirds through, and when the wounded surface has dried the cutting can be entirely removed.—

Erodium (Gr. *ἑρῶδις*, a heron) is a genus closely related to *geranium*, from which it principally differs in having the leaves pinnately instead of palmately divided, and in the twisting of the styles when in fruit they break away from the beak-like receptacle. The plants are mostly natives of Europe and the East, and there is one species indigenous to Texas, *E. Texanum*. The only *erodium* of special interest is *E. cicutarium*, which is sparingly naturalized in some of the eastern states, and abundantly so on the Pacific coast, where it is of great service as a forage plant, its young growth furnishing a bite to the cattle when there is but little else for them to eat. It is known as pin grass, and also by the Mexican name of *alfilaria*.

GÉRARD, the Blessed, a saint of the Roman Catholic church, and founder of the order of knights hospitallers of Saint John of Jerusalem. (See SAINT JOHN OF JERUSALEM.)

GÉRARD, Cécile Jules Basile, a French officer, born at Pignans, Var, June 14, 1817, drowned in Africa in September, 1864. Enlisting in the spahis, he landed in Africa in 1842, and two years later killed his first lion. In all he killed 25. On his return to France he gave the results of his experience in *La chasse au lion* (1855) and *Gérard le tueur de lions* (1856). The latter work has been translated into English under the title of "Gérard the Lion Killer." He afterward proposed to explore the Kong range in western Guinea, which had not yet been visited by any European. Starting from England in the latter part of 1863, he attempted to penetrate into the interior of Africa through Dahomey. Failing in this, he proceeded to Sierra Leone, whence an English man-of-war took him to the river Gallinas. He started again for the interior, but having been plundered of his baggage he resolved to return to Sierra Leone. While crossing the river Jong he was drowned.

GÉRARD, Etienne Maurice, count, a French marshal, born at Damvillera, April 4, 1773, died in Paris, April 17, 1855. He enlisted in 1791 as a private, served under Damouriez and Jourdan, and obtained a colonelcy in 1800. He distinguished himself at Austerlitz, Halle, Jena, and Wagram, receiving as reward for his services the rank of general of brigade and a barony. After service in Portugal and Spain, he joined the Russian expedition, and as general of division evinced unfaltering energy during the retreat from Moscow. He was severely wounded in the campaign of 1813, and in 1814 fought successfully against the invading troops.

During the campaign of 1815 he was placed under the command of Grouchy, who had orders to prevent the Prussians from joining the English army under Wellington. On the morning of June 18, hearing the report of cannon, he strongly urged a march toward Waterloo, but was overruled. On the fall of Napoleon, Gérard left France, and did not return till 1817. In 1822 he was elected deputy, took his seat among the opposition members, and was reelected in 1823 and 1827. He contributed to the success of the revolution of 1830, and after being minister of war for three months, reentered the chamber of deputies. Having been promoted to the rank of marshal, he was in 1831 intrusted with the command of the French army sent to protect Belgium against Holland. In 1832 he commanded at the siege of Antwerp, which he forced to capitulate, Dec. 28. In 1834 he again held for three months the office of minister of war. He was made count in 1818, peer in 1832, grand chancellor of the legion of honor in 1835, commander general of the national guards of the Seine in 1838, and senator in 1852.

GÉRARD, François Pascal Simon, baron, a French painter, born in Rome in 1770, died in Paris, Jan. 11, 1837. He entered the studio of David in 1786; in 1792 he visited Italy, but soon returned, and exhibited in 1795 his first great picture, "Belisarius." "The Three Ages," "Cupid and Psyche," "Ossian," and the "Battle of Austerlitz," which appeared in succession from 1806 to 1810, established his fame. The last was applauded for its accuracy and beauty by Napoleon, who, as well as nearly all the members of his family, had their portraits painted by Gérard. At the command of Louis XVIII. he executed in 1817 his "Entry of Henry IV. into Paris." His "Louis XIV. declaring his grandson Philip of Anjou King of Spain" appeared in the public exhibition of 1828; and his "Coronation of Charles X." in that of 1829. Under Louis Philippe he executed various important works in the halls of the historical museum at Versailles and in the cupola of the Pantheon. The latter, completed in 1836, were the last of his performances. During his career, besides 80 historical pictures, some of which are of very large dimensions, he painted nearly 800 portraits.

GÉRARD DE NERVAL (GÉRARD LABRUNIE), a French author, born in Paris, May 21, 1808, died there, Jan. 24, 1855. He published when

18 years old a series of poems entitled *Élégies nationales*, and in 1828 a new translation of *Faust*. He wrote dramas either by himself or in conjunction with Alexandre Dumas, one of which, *Léo Burckart*, was published in 1839 with notes. In 1850, in conjunction with Méry, he produced *Le chariot d'enfant*, a metrical translation of an Indian drama, and a series of philosophical and biographical essays upon eccentric characters, entitled *Les illuminés, ou les précurseurs du socialisme* (1852). On the morning following the anniversary of the death of Jenny Colon, an actress whom he loved devotedly, he was found hanging and dead in the street.

GÉRARDMER, *Géromé*, or *Girumetz*, a town of France, in the department of Vosges, on the margin of Lake Gérardmer, near the German frontier, 22 m. S. E. of Épinal; pop. in 1866, 6,225. It covers a considerable extent of ground, the houses mostly standing in gardens. It has a large trade in cheese, known as *Géromé* cheese. Lake Gérardmer is the most beautiful of the inland waters of France; it is oval in shape, about 1½ m. long, and traversed by the river Valogne.

GERASA, or *Galasa* (now *Jerash*), a ruined city of Palestine, E. of the Jordan, in the ancient



The Little Theatre at Gerasa.

Decapolis, 55 m. N. E. of Jerusalem, on the opposite slopes of two hills, between which flows the river Kernan. The most interesting of its remains extend along the right bank of the stream, and comprise a Corinthian temple and triumphal arch, five or six other temples, and two theatres, all of marble; a naumachia, or artificial basin for the representation of sea fights; and a small temple, with a semicircular Ionic colonnade from which a street, lined with rows of columns, traverses the city. At right angles with this are three other streets, all full of relics of ancient greatness. There are raised walks for foot passengers on either side, while

the centre course still shows marks of chariot wheels. The walls, which are pierced by three ornamented gateways, and flanked by occasional towers, are in tolerable preservation. Outside is an extensive necropolis; 200 yards N. E. is a large reservoir, and near it can be traced an aqueduct. The river and valley are crossed by two bridges. There are two grand baths, and inscriptions, chiefly of the time of Antoninus Pius, but in general much defaced, are met with in all directions. Mention of Gerasa is first made by Josephus, who states that King Alexander Jannæus, after subduing Pella, attacked and captured it, about 85 B. C. It is referred to by Greek and Roman writers, but no details of its history are given. After the Roman conquests in the East the district around Gerasa became one of their favorite colonies. It was burned by the Jews at the commencement of their war with the Romans, and taken again by Annus, one of Vespasian's generals. Half a century later it attained its greatest prosperity. On the rise of Christianity it became the seat of a bishop. In 1122 Baldwin II. captured it and destroyed the castle.

GERBOA. See **JERBOA**.

GERDIL, Hyacinthe Sigismund, a Savoyard philosopher, born at Samoens, June 23, 1718, died in Rome, Aug. 12, 1802. He became a Barnabite, studied theology in Bologna, won the friendship of Cardinal Lambertini, afterward Pope Benedict XIV., and became professor of philosophy at Macerata, at Casale, and finally at Turin. Refusing the dignity of general of his order, he became tutor to the prince of Piedmont, afterward Charles Emanuel IV. of Sardinia, the rich abbey of Chiusa being given him, whose revenues he devoted to charity. His first works were *Éclaircissements sur la notion et la divisibilité de l'étendue géométrique* (Turin, 1741), and *Immatérialité de l'âme démontrée contre Locke* (1747). To these works succeeded almost every year until his death others in Latin, French, or Italian, on questions of theology, philosophy, physical or mathematical science, and sociology. He was created a cardinal *in petto* by Clement XIV., and officially proclaimed as such in 1777 by Pius VI. Appointed prefect of the Propaganda, protector of the Maronites, and corrector of oriental publications, he led in Rome a life of the most laborious poverty. He sold his library in 1798 in order to support himself, followed Pius VI. to Siena, and would have been unanimously chosen by the conclave as his successor, if the fact of his being a native of Savoy, then a part of France, had not caused Austria to oppose him. His complete works were published in Rome (20 vols. 8vo, 1806-'21). An edition of his select works in 12 vols. was begun in Paris in 1826, but only 2 vols. have appeared. In 1863 Migne published a selection of his theological works in 1 vol. large 8vo.

GERDY, Pierre Nicolas, a French physiologist, born at Loches, Aube, May 1, 1797, died in Paris,

March 18, 1856. In 1834 he became professor in the Paris faculty of medicine, and in 1837 was elected a member of the academy of medicine. His treatment of physiology was systematic rather than experimental, and he carried to an extreme degree the doctrine of the so-called vital properties residing in as many different organs and tissues of the body, and accounted directly for the phenomena of life, without any reference to the action of physical or chemical forces. His publications were numerous and varied in character, most of them appearing in the medical journals or in the bulletins of the academy of medicine. He also wrote *Anatomie des formes extérieures, appliquée à la peinture, à la sculpture et à la chirurgie* (1829); *Traité des bandages et des pansements* (1837-'9); *Physiologie philosophique des sensations et de l'intelligence* (1846); and *Chirurgie pratique*, uncompleted (1851-'5).

GERFALCON, or Jerfalcon. See **FALCON**.

GERHARD, Eduard, a German archaeologist, born in Posen, Nov. 29, 1795, died May 12, 1867. Resigning a professorship at Breslau on account of weak eyes, he travelled in Italy, and resided 15 years in Rome. He was engaged on Platner's *Beschreibung der Stadt Rom*, planned by Niebuhr, and then directed by Bunsen, for which he undertook to furnish a complete account of the sources of knowledge concerning ancient Roman topography, under the title of *Scriptores de Regionibus Urbis*. When in 1828 the crown prince of Prussia visited Italy, Gerhard accompanied him to Naples, and obtained his protection for the *Instituto di corrispondenza archeologica*, founded at Rome, of which Gerhard was director until his return to Prussia in 1837. He was afterward appointed archaeologist of the royal museum at Berlin, professor in the university of that city, and member of the academy of sciences. Among his numerous writings are: *Antike Bildwerke* (Stuttgart, 1827-'44, with 140 copperplate illustrations); *Auserlesene Griechische Vasenbilder* (4 vols., Berlin, 1839-'58, with 330 plates); *Griechische und Etruskische Trinkschalen* (1840); *Etruskische und Campanische Vasenbilder* (1843); *Trinkschalen und Gefässe* (2 parts, 1848-'50); and *Ueber die Hermenbilder auf Griechischen Vasen* (1856).

GERHARDT, Charles Frédéric, a French chemist, born in Strasburg, Aug. 21, 1816, died there, Aug. 19, 1856. The son of a manufacturer of chemical products, he studied in 1835 in Liebig's laboratory at Giessen, and in 1844 was appointed professor at Montpellier, where he remained four years. He returned to Paris and established a private laboratory, in which he continued his researches till 1855, publishing papers upon homologous series, the theory of types, the anhydrous acids, and the starches. In 1855 he accepted the chair of chemistry and pharmacy at Strasburg. Among his most important publications is the *Traité de chimie organique* (4 vols. 8vo, 1853-'6), upon which he was occupied a large portion of his life, and in

which he presents a complete account of the actual progress of organic chemistry. The work was intended as an appendix to Berzelius's *Chimie minérale*.

GERHARDT, Paul, a German poet and theologian, born at Gräfenhainichen, near Wittenberg, March 12, 1807, died at Lübben, June 7, 1876. Little is known of his life till in 1851 he became pastor at Mittenwalde, a position which he exchanged in 1857 for that of deacon in the church of St. Nicholas in Berlin. He was there at the head of the strict Lutherans against the syncretism of Calixtus and his followers, and was deprived of his diaconate because he refused to obey the edict of 1864 forbidding either party to defame the other in the pulpit or tax it with heresy. In January, 1867, he was reinstated in his office, but resigned the following month, and in 1868 became arch-deacon in Lübben. He is esteemed the author of the best German hymns after those of Luther; several of them were translated by John Wesley, and are found, in part at least, in the Methodist hymn book. In Germany they were first collected under the title of *Geistliche Andachten in 120 Liedern* (Berlin, 1866), and many of them are contained in most of the Protestant hymn books in Germany. Of their numerous editions, the best is that of Philipp Wackernagel (Stuttgart, 1848).

GERICAULT, Jean Louis Théodore André, a French painter, born in Rouen in 1790, died in Paris, Jan. 18, 1824. He was a pupil of Carle Vernet and of Guérin, and his first pictures, the "Guide of the Imperial Guard in 1812" and the "Wounded Cuirassier," were well received. In 1816 he went to Italy, and in 1819, on his return to France, he exhibited the "Raft of the Medusa," a very dramatic scene, executed in the most powerful style, which is considered one of the masterpieces of the French school.

GERLACH, Otto von, a German theologian, born in Berlin in 1801, died there, Oct. 24, 1849. He held various ecclesiastical offices, and not long before his death became professor at Berlin. He published several works, prominent among which are a commentary on the Scriptures, known as the *Gerlach'sche Bibel*, which was continued after his death by Schmieder. He also edited *Auswahl von Luthers Schriften* (24 vols., Berlin, 1840-'48).—His elder brother, **ERNST LUDWIG**, born in Berlin, March 7, 1795, is prominent as an ultra-conservative journalist and politician, and as the parliamentary leader of the high-church party in Prussia.

GERMAN CATHOLICS (*Deutschkatholiken*), a religious denomination, formed in 1844 by secession from the Roman Catholic church of Germany. It owed its origin mainly to a letter written Oct. 1, 1844, by Johannes Ronge, an excommunicated priest of Silesia, to Bishop Arnoldi of Treves, in which the exhibition of the holy coat of Treves was called an idolatrous festival, and the bishop was called upon

to suppress it. In the Prussian province of Posen another Catholic priest, Johann Czerski, had already declared on Aug. 22 his secession from the Roman Catholic church, and had attempted the foundation of a Christian apostolic Catholic congregation. After the publication of the letter of Ronge these two united, and a number of congregations, who called themselves German Catholics, sprang up within a short time. The "Confession of Schneidemühl," drawn up by Czerski, rejected the reception by the priests alone of the Lord's supper in both kinds, the canonization and invocation of saints, indulgences and purgatory, fasting, the use of the Latin language in divine service, the celibacy of priests, the prohibition of mixed marriages, the supremacy of the pope, and other points. They retained the seven sacraments and the mass, which they celebrated in the vernacular language. The "Confession of Breslau," which set forth the views of Ronge, also claimed free investigation of the Bible and freedom of belief for every individual member. A council which met at Leipsic, March 22, 1845, adopted a new creed mostly based on the "Confession of Breslau." From this time the principles of German Catholicism spread very rapidly. The attitude of the governments with regard to it was very diverse. In Austria and Bavaria it was even forbidden to use the name. A serious obstacle to the growth of the new religious denomination was found in their internal dissensions. There had been from the beginning a radical disagreement between Ronge and Czerski. The latter agreed in general with the doctrines of orthodox Protestantism, while the former adopted almost all the views of the Protestant rationalists. Czerski issued a circular ("New Confession of Schneidemühl") against those who denied the divinity of Jesus Christ. An attempt to unite the two parties on a common platform was made in an assembly at Rawicz, February, 1846, but it had not the desired effect. The revolutions of 1848 seemed to be very favorable, and some additions were made to their congregations in Austria and Bavaria; but after their suppression German Catholicism was again prohibited in those countries. The second council of Leipsic, which met in May, 1850, had to be transferred to Köthen on account of the interference of the police; it proposed an alliance with the Free congregations, which had formed themselves by secession from the Protestant churches, and the election of a joint executive committee from both denominations, which was to act as a presiding board until the meeting of a triennial diet, which was appointed for 1852, but it did not meet. In June, 1859, the representatives of the German Catholics and Free congregations met at Gotha, where a union between the two parties was effected under the name of *Bund freireligiöser Gemeinden*. In 1862, however, they were again divided, and the majority of the German Catholics joined the national Protestant church.—The fullest

history of German Catholicism is given by Kampe, *Geschichte der religiösen Bewegungen der neuern Zeit* (4 vols., Leipzig, 1852-'60).

GERMANIC RACES AND LANGUAGES. Before the political history of Germany began, or a distinct German nation appeared, Germanic races moulded the political organizations of the north and west of Europe, and Germanic languages either superseded or modified the speech of the previous inhabitants. Ethnologists sometimes classify the Germanic races under the generic name of Teutons, as a main division of the Slavo-Germanic branch of the Aryan or Indo-European family of nations. The term Teutonic, in this wider sense, is chiefly used by English writers, as the equivalent of the German *Germanisch* (Fr. *germanique*), in contradistinction to *Deutsch* (Fr. *allemand*), in the narrower sense, and is thus often used in this work. Three groups are distinguished: Scandinavians, Goths, and Germans. The Scandinavians occupy Norway and Sweden (excepting the territory of the Lapps), the Danish isles, and the peninsula of Jutland. The Goths, now extinct, were subdivided into Ostrogoths and Visigoths, or Eastern and Western Goths. The Germans are subdivided into two groups, the northern and southern, or Low and High Germans, and are found principally in Germany, the Netherlands, England, the United States, and the British colonies. There are many hypotheses in regard to the meaning of the word German. Some authorities derive it from the old High German *ger*, spear or javelin, and consider the *Germani* of the ancients as the equivalent of *Germanen* or men armed with such weapons. Others derive it from the Celtic *gairm* or *garm*, noise, and understand it to refer to the ancient German practice of shouting in battle. The modern German word *Deutsch* is held by some to be a modification of the name Teut, Tuisco, or Tuisto, a mythical ancestor of the Germans; others trace it to *diot*, old High German *diot*, pertaining to the people, or national; and others again to the verb *diutan*, to explain. The cradle of the Indo-Europeans is generally placed in Asia, whence the Germans have been supposed to have entered Europe across the Ural and Caucasus. Some recent authorities, however, remove the primitive habitat of the Aryans from the sources of the Oxus and Jaxartes to the Russo-Lithuanian plateaus, contiguous to the first historical habitat of the Germans, north of central Europe, and within the boundaries of the Rhine, the Danube, and the Vistula. There are no positive data about the Germanic races prior to the 2d century B. C. No mention is made of them when the Hellenes came in contact with the Scythians, and the Gauls carried terror to Rome and Delphi. Pytheas of Massalia met with Goths and Teutons on the Baltic, and it is probable that the Goths inhabited Scandinavia before the 4th century. Arrian says that Alexander the Great had dealings with peoples living on the lower Ister (Danube),

whom he calls Celts; but he mentions the Germanic Quadi and Marcomanni as tribes of them. It is evident that the Greek writers often speak of Germans as Celts or Galatians. Strabo designates the Germans as Celto-Scythians, meaning a people neither Celtic nor Scythic. The uncertainty of the Greek and early Roman writers concerning them renders it presumable that the Germans lived before the time of the Cimbric migrations isolated from their neighbors to the south and west, while the correlation of the two linguistic groups seems to indicate that they lived in constant intercourse with the Slavs. In the 2d century B. C. the Germanic races became the dominant element in western and central Europe. The first historical migration started from the Cimbric peninsula, whence the tribes composing it were indiscriminately called Cimbri. Other migrations of the same period took their rise in the region of the Baltic, and the name of Teutons was given to the tribes figuring in these. The Celts previously moved to the west and south, but many of them had retraced their steps, and migrated with Germanic races from west to east. This mixed people appeared under Cambaules and Cerethrius in Thrace, and after the dissolution of the Macedonian empire under Brennus in Macedonia and Greece, and under Leonnarius in Asia Minor. The torrent of Cimbri and Teutons which rushed over the Alps at the close of the 2d century B. C. failed to weaken the Romans in the mountainous districts of northern Italy and Illyria. Germanic tribes were for centuries put to their utmost to prevent the further advance to the north of their southern enemies. Cæsar and Tacitus are the most valuable authorities upon the condition of the western districts of Germany in their time. Cæsar states that the Rhine was the eastern boundary of Gaul, and affirms that in Switzerland, southern Alsace, near the upper Moselle, and on the shores of the strait of Dover, there were only four Celtic tribes, the Helvetii, Sequani, Mediomatrici, and Morini. He called the country of the Maas, north of Sedan, Germania Inferior, and the left bank of the Rhine, between Breisach and Linz (near Coblenz), Germania Superior. Tacitus divides the Germans into three classes, which he says were the descendants of the three sons of Mannus, the son of Tuisto, a god whom all Germans adored. He names Ingævones as living close to the sea; Hermiones inhabiting the centre; and all others were Istævones. He mentions also as original divisions, according to some, the Marsi, Gambrivii, Suevi, and Vandals. Pliny the Elder knew five principal divisions of Germans: Vindili, Ingævones, Istævones, Hermiones, and Peucini. The Germanic races formed confederations at a very early period. The most ancient known were the confederation of Suevi, described by Cæsar; another of Cherusci, founded by Arminius; and a third of Marcomanni, with Marbodius as chief. The Batavi settled on the banks of the

Rhine, around the lowest portion of its course, the Ubii near Cologne, the Treviri near Treves, the Nervii in Hainaut, the Vangiones near Worms, the Nemetes near Spire, and the Tribocci in Alsace. Between the Rhine and the Elbe lived the Catti (Hessians), with the Usipii N. of the Lippe, the Sigambri and Tencteri between the Ruhr and Sieg, the Cherusci around the Hartz, the Bructeri in Westphalia, and further north the Chamavi and Angrivarii. Between the Weser and the Ems lived probably the Dulgibini and Chasuari mentioned by Tacitus. On the shores of the North sea were the Frisii and Chauci, and on those of the Baltic the Heruli and Rugii. On the lower Elbe lived the Saxons, with the Angles S. E. of them; higher up on the west bank of the river, the Longobards. On the Danube, and subsequently in Bohemia, were the Marcomanni, and E. of them the Quadi. In Silesia dwelt the Semnones, Lygii, and Burgundians, and between the Vistula and the Pregel, the Goths. The name of Suevi was given to a confederation of tribes scattered over the territory between the Elbe, the Vistula, and the Baltic. This confederation reached subsequently to the southern portions of Germany, where its name Swabians (*Schwaben*) is still current. It is impossible to state the precise limits of the different tribes. There was a constant shifting of settlements, and the subsequent migrations have rendered the boundaries of Tacitus totally undistinguishable. The southward pressure of the Germans, Slavs, Finns, Huns, and Avars commenced in the 3d century A. D. The result was the withdrawal of the Romans from the southern portion of Germany, and the loss of the eastern portion to Slavic and Finnic tribes. The Longobards settled for a while in the north of Hungary, the Gepidæ in the east of it, the Goths in Moesia and Illyria, the Marcomanni in Vindelicia and Noricum, the Alemanni and Burgundians in Helvetia. The whole original territory from the mouth of the Danube to the delta of the Rhine was thus occupied again by Germanic races. But the pressure of the eastern races continued, and impelled by it about one half of the German warriors attacked the Roman empire, and divided southern Europe among them. The whole Gothic family of Vandals, Heruli, Rugii, Gepidæ, Alani, Suevi, Longobards, Burgundians, and Franks left Germany almost entirely, and the Slavs and Finnic races took possession of the thinly populated districts, and extirpated in several places the German inhabitants. The Gothic empire on the Danube, founded there after the exodus of the Goths from the Baltic territory, was conquered by the Huns. After Attila's death the Goths separated again into the old divisions of Eastern and Western Goths. The Visigoths were led by Alaric to Italy (about 400), and by his successor Ataulf to Spain, and became Romanized. Theodoric led the Ostrogoths to Italy (489), where he founded a mighty empire, which after his death was absorbed by the Byzantines.

The people disappeared in the small remnants that survived the disasters of the long war. The Burgundians moved to the Rhine and Neckar, and subsequently into Roman Gaul, where they settled between the Aar and the Rhône, and founded an empire, which was conquered and absorbed by the Franks about 534. They too became Romanized. The Vandals moved from the Oder and Vistula to Dacia. Early in the 5th century they conquered Spain, and Genseric took them to Africa, where they founded an empire, which was conquered by Belisarius in 534, when the Vandals disappeared. The Scandinavians remained in comparative isolation. The Goths inhabited only a small portion of the Scandinavian peninsula, going no further north than the lakes Wener, Wetter, and Hielmar. From the population south of Jutland went forth the stock of the English-speaking race. During the 5th and 6th centuries three Germanic tribes, the Jutes, Angles, and Saxons, crossed the North sea, settled in the British islands, and subjugated the former population. The country of the Rhine and the Weser then became the main abiding place of pure Germanic elements. The principal races in the old homestead were now the Saxons, Thuringians, Franks, and Bavarians, and they were in danger of being overrun by the Slavs. Charlemagne succeeded in driving the Wends back to the Vistula, the Sorbs to the Oder, the Czechs to the lower Carpathians, and the Croats as far as Spalato in Dalmatia, and also in destroying the Avar power in Pannonia. The Moors had destroyed the empire of the Visigoths, and the Frankish empire absorbed the other Romano-Germanic states, with the exception of small fractions in Italy. This empire comprised the whole of Gaul and Germany as far as the Oder, and after its division it was found necessary to frame treaties in both the Romance and the German language. The portion which Louis the German received at the division of the East Frankish empire in 870 embraced all the pure Germanic races, excepting those on the Maas and the Scheldt. The earliest record of the existence of German as a national language dates from A. D. 813 (*lingua Theutisca*, *Theotisca*, *Theudisca*, *Theodisca*), and the development of the German nation as a blending of several races into one belongs to the same century. Conrad I. and Henry I. subdued the dukes of the Swabians, eastern Franks or Franconians, and Bavarians, and under Otho I. a German empire appeared. During this period the Scandinavians peopled the Faroe and Shetland islands, the Orkneys and Hebrides, Iceland, and Greenland, and visited the north coast of the American continent. They established themselves also in the British isles and France (Normandy). These dispersions produced however no lasting effect, except in Iceland and the Faroe islands. The Northmen of Normandy became Gallicized, went to Italy, founded there the empire of the Two Sicilies, and conquered England in

1066. The Danes moved south on the peninsula of Jutland as far as the Schlei, but their invasions of England, prior to the Norman conquest, proved fruitless in the end. The Swedes were similarly unsuccessful in Esthonia and Livonia, but their conquest of Finland led to a lasting establishment of their nationality on the European mainland, which the Russian occupancy of the country since the beginning of the 19th century has not been able to efface. The history of the German empire after Otho I. is a series of contests between the emperors and the dukes of the principal races composing it. The Saxons, the Franconians, and the Swabians were in turn at the head of the empire in the persons of their own leaders. The political significance of special races ceased in the 18th century, but in language and manners there are still five which may be clearly distinguished. The Saxon race is dominant in the northwestern lowlands of Germany, especially in the northern districts of the Elbe, across the Hartz to Cassel, and across the Weser to the mouth of the Rhine. The Frankish race extends from the Fichtelgebirge to Treves, and from Hesse to the Rauhe Alp. The Thuringians inhabit the section between the Thuringian forest and the Hartz, and from the Werra far into Brandenburg. The Swabians live between the central Neckar and the Alps, and from the upper Rhine to Augsburg. The Bavarians reach from Augsburg to Vienna, and from the Fichtelgebirge to the Tyrol.—The boundaries of the modern German language are not coincident with the limits of the present German empire. In the northwest, German is spoken in some portions of the French department of Le Nord, the south and east of Belgium, and the eastern portion of the Netherlands. In the southwest, German is heard as far as the Doubs, the eastern Jura, the lake of Neuchâtel, and Monte Rosa in Italy. In the south, the language reaches from Monte Rosa to Mount St. Gothard, and thence almost directly east as far as the Mur in Styria. In the

east, the line may be drawn from Radkersburg on the Mur, through Presburg in Hungary, to Pöhrnitz on the Iglau in Moravia, thence to Krümman on the Moldau in Bohemia, and thence again to Taus. Further N. E. the territory of the German language reaches to Leitmeritz on the Elbe, and to the sources of the Oder in Austrian Silesia, whence the boundary runs directly N. to Krotoschin in Posen, and thence indefinitely to Interburg in East Prussia and N. W. to the Kurische Hafl. The N. boundary follows the Baltic from Polangen to Flensburg in Schleswig, and the North sea from Tondern to Gravelines. It is possible to distinguish about 20 different dialects within this territory. They may be divided into Low German and High German dialects, of which the latter may be subdivided into South German and Middle German. Since the time of Luther these historical peculiarities of speech have however in a great measure disappeared, and are heard only among the lower classes.—LANGUAGES. Of all the numerous Teutonic tongues of ancient times, only five languages, German, Dutch, English, Danish, and Swedish, are now in a flourishing condition. Linguists consider the Scandinavian, Gothic, and German forms of speech as descended, in common with the modern idioms of India, Persian, Greek, Latin, Celtic, Slavic, and Lithuanian, from a single parent tongue, Sanskrit. It was, however, deemed necessary to go further, and to derive the whole group of Indo-European tongues from a primitive language, which was also the mother of Sanskrit. This language, of which no monuments exist, has been constructed by the science of comparative grammar, not as the primitive tongue from which all forms of speech are derived, but as one of many primitive languages, and as the parent of Sanskrit, Greek, Latin, Gothic, &c., as Latin is the mother of French, Italian, and Spanish. The following table exhibits the probable course of development of the Teutonic tongues:

PRIMITIVE GERMANIC OR TEUTONIC	{	LOW GERMAN ..	{	Scandinavian	W. Scandinavian, Old Norse.....	<i>Icelandic.</i>
					E. Scandinavian.....	<i>Swedish.</i>
				.....		<i>Danish.</i>
					Old Frisian	<i>Frisian.</i>
		.....	{	Anglo-Saxon ...	<i>English.</i>	
				Middle Dutch. ..	<i>Dutch.</i>	
				Old Saxon	<i>Platt-Deutsch.</i>	
	Gothic.					
HIGH GERMAN...	Old High German...	Middle High German.....	<i>German.</i>			

Among the Indo-European languages, Gothic diverges widely from the primitive tongue, and must be considered as a younger sister of Sanskrit. Gothic was not the oldest of the Germanic tongues, though its literary documents date back further than any other. Old High German, old Norse, Anglo-Saxon, and Gothic

were probably sister dialects; at least no one of them appears to be derived from any of the others. Old High German comprises a number of dialects which were spoken chiefly in South Germany, as the Thuringian, Frankish, Swabian, Alsatian, Swiss, and Bavarian. They are found in literary records dating

from the 8th to the middle of the 11th century. A gradual change took place subsequently in the language, and it became the mother of a new dialect, which is called the middle High German, and which survived it in the same districts of upper Germany. The literature of middle High German reaches from the 12th to the end of the 15th century, and it is so clear, grand, refined, and melodious, that it has been called the first classical period of German literature. A new modification of the old High German, and a daughter of the middle High German, made its appearance for the first time in a literary production of note in Luther's translation of the Bible, and in its rapid development seems to have reached its culminating point in the literature of the present century. Under the term Low German are comprised all the dialects spoken in the lowlands of Germany. The old Saxon, which belongs to this group, was spoken between the Rhine and the Elbe, in the districts which lie at the foot of the central plateau of Germany. Its literary documents date from between the 9th and 11th centuries, and had their origin in the districts of Münster, Essen, and Cleves. The old Saxon is the mother of the middle Low German, which is to be distinguished from the middle German and middle Netherlandish or middle Dutch, and also from the modern derivative of it called modern Low German, or Platt-Deutsch. While old Saxon most closely approaches old High German, the dialect spoken in the districts of Thuringia and the region between upper and lower Germany formed a kind of transition between High and Low German. On the N. coast of Germany, between the Rhine and the Elbe, and beyond the latter river as far as Jutland, extended the old Frisian dialect. Its literary records are of comparatively late date, but it displays a very antique cast, resembling most closely the old High German. The Dutch language has no literature earlier than the 16th century, but it is still a literary and national language; while Flemish, which was also used during this period in the courts of Flanders and Brabant, had to give way to the official languages of Holland and Belgium, and its use is almost completely confined to the Flemish peasantry. Anglo-Saxon is also a Low German dialect. The four Germanic tribes that invaded Britain have left no record in the dialects peculiar to each, and there are no facts from which to determine the precise nature of their speech. The Jutes who settled in Kent, Hampshire, and the Isle of Wight probably did not speak an old Norse dialect, as no traces of it are found in those districts. The Angles, coming from a settlement adjacent to the Saxons, may also have spoken a Saxon dialect. The Saxons of England called themselves simply Saxons, in distinction from the old Saxons, or those who had remained on the continent; but it is still doubtful whether they belonged exactly to one and the same tribe. The term Anglo-Saxon

No.	1	2	3	4	5	6	7	8	9	10
Primitive.	aina-	dua, dva	tri-	katvar	kankan	kshaks	saptan	aktu	navan	dakan
Sanskrit.	eka-	dva	tri-	chatúr	pánchan	shash	sáptan	ashtau	návan	dáśan
Greek.	εἷς, ἑν	δύο	τρεῖς, τρι	τέτταρες	πέντε	ἕξ	ἑπτά	ὀκτώ	ἐννέα	δέκα
Latin.	unus	duo	tres	quatuor	quinque	sex	septem	octo	novem	decem
O. H. G.	ein	zwehē	dri	vior	finf	sehs	sibun	ahthō	niun	zehān
M. H. Ger.	ein	zwehe	dri	vier	vunf	sehs	siben	ahht	niun	zehen
German.	ein (s)	zwei	drei	vier	funf	sechs	sieben	acht	neun	zehn
Gothic.	ain (s)	twai	preis	fidvor	finf	saihs	siun	ahthau	niun	talhun
Old Norse.	ein	tvair	þrír	fiowr	finn	sex	siau	átta	nú	tiu
Swedish.	en (ett)	två	tre	fyra	fem	sex	sju	átta	nio	tio
Danish.	een (seet)	to	tre	fire	fem	sex	syv	aatte	ni	ti
Old Fris.	én	twēne	thrē	fiwer	fif	sex	sign	achta	nigun	tian
Old Sax.	én	tnēna	thria	fiwar	fif	sehs	siðun	ahthō	nigun	tchan
Dutch.	één	twee	drie	vier	vijf	zes	zeven	acht	negen	tien
Ang Sax.	án	twegen	þrī	feówer	fif	six	seofen	ahta	nigon	tin
Old English.	an, on	twoy, tuo	pre	four	five	sixe	seuen	eigte, aught	nyne, nye	ten
Engl.	one	two	three	four	five	six	seven	eight	nine	ten

is however applied to all Germanic dialects spoken in England after the 5th century. The language of the period extending to the end of the 10th century is distinguished as old Anglo-Saxon, with two principal dialects, the Saxon and Anglian, or southern and northern, of which the Anglian or northern was the most affected by Norse influences. The language of the subsequent period was a strange mixture of Anglo-Saxon with the Norse of the Danes and Norwegians, and the Norse-French of the Norman conquerors; and the literary documents are characterized by a considerable loss of the inflectional forms. Modern Anglo-Saxon or English is divided into three periods: old English, middle English, and modern English. Old English continued to disregard the old inflectional forms, especially in the declension of substantives. Middle English is characterized by an almost total absence of declensions of nouns and adjectives, and a great diminution of strong verbs. Modern English continued the same decline, and has now been stripped of all inflectional forms with the exception of the *s* and *st* of the present and the *ed* and *en* of the preterite of verbs, the *ing* of the present participle, the *s* of the genitive and plural, the degrees of comparison of adjectives and adverbs, and a few pronominal cases. Old Norse is the dialect which from an unknown period to the 11th century was spoken in Sweden, Norway, Denmark, and the adjacent islands. It is believed that it was split at a very early date into two sister dialects, one the mother of old Norse or Icelandic, the other the parent of Swedish and Danish. The first germs of Swedish and Danish are considered to have existed long before the 11th century in the dialects of the Scandinavian

tribes. Swedish scholars distinguish between the East and West Scandinavian, which division they consider as having taken place before the Northmen settled in Norway and Sweden. The stationary existence of the Norse language in Icelandic, in which it has been preserved almost intact to the present day, is explained by the secluded position of the island, and the zeal with which the old songs and sagas, as collected and fixed in the two Eddas, have been cultivated by the inhabitants.—In regard to the degree of relationship in which these languages stand to each other, and in which they stand collectively to cognate languages, the six old Teutonic tongues may be classified in three groups: 1, the Low German, with the Gothic and its nearest relatives Anglo-Saxon, old Saxon, and old Frisian; 2, the old High German; 3, the old Norse. The affinities between these languages and the modern tongues derived from them are illustrated in the foregoing table. The first ten cardinal numbers have been chosen for this purpose, as numerals are preferable for comparative purposes to any other class of words on account of the invariableness of their meaning. The Latin, Greek, and Sanskrit forms have been added to show the degree of relationship of the Germanic to the cognate groups of the Aryan or Indo-European family of languages. The primitive tongue is understood to be the mother of all, and gives the forms from which linguistic scholars derive those of the most ancient as well as of the modern Aryan dialects. The changes which the words have undergone in these languages have been discovered to appear in each according to fixed principles, which in linguistic science are known as Grimm's law.

GENERAL TABLE OF GRIMM'S LAW.

	I.			II.			III.		
	1.	2.	3.	4.	5.	6.	7.	8.	9.
I. { Sanskrit	gh (h)	dh (h)	bh (h)	g	d	b	k	t	p
{ Greek	χ	θ	φ	γ	δ	β	κ	τ	π
{ Latin	h, f (g, v)	f (d, b)	f (b)	g	d	b	c, qu	t	p
II. Gothic	g	d	b	k	t	(p)	h, g (f)	th, d	f, b
III. O. H. German	k	t	p	ch	z	ph (f)	h, g, k	d	f, v

The law is stated by Max Müller as follows: "If the same roots or the same words exist in Sanskrit, Greek, Latin, Celtic, Slavonic, Lithuanian, Gothic, and High German, then wherever the Hindoos and the Greeks pronounce an aspirate, the Goths and the Low Germans generally, the Saxons, Anglo-Saxons, Frisians, &c., pronounce the corresponding hard check. . . . Secondly, if in Greek, Latin, Sanskrit, Lithuanian, Slavonic, and Celtic we find a soft check, then we find a corresponding hard check in Gothic, a corresponding breath in old High German. . . . Thirdly, when the six first named languages show a hard consonant, then Gothic shows the corresponding breath, old High German the

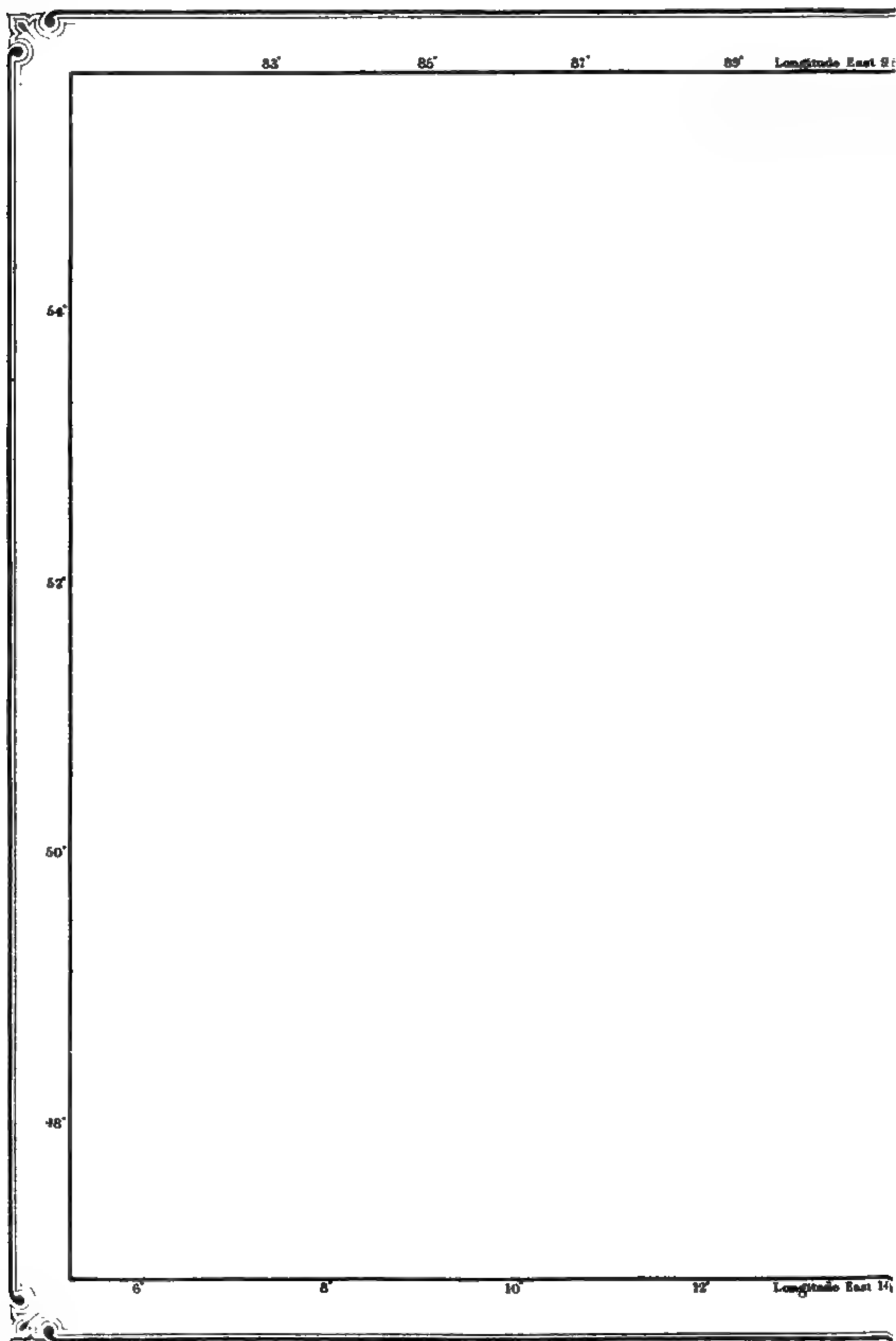
corresponding soft check." In illustration of the different formulas we add examples for each class and division. 1. Sansk. *hansa*, Gr. *χῆν*, Lat. *anser* (= *hanser*), Goth. *gana*, O. H. Ger. *kana*, Ger. *Gans*, Eng. *goose*; Sansk. *hyas*, Gr. *χῆς*, Lat. *heri*, Goth. *gistra*, O. H. Ger. *kistar*, Ger. *gestern*, Eng. *yesterday*. 2. Sansk. *dhriś*, Gr. *δαρσις*, Goth. *ga-dauran*, O. H. Ger. *tar-ran*, Eng. *to dare*. 3. Sansk. *dhri*, Gr. *φῆρα*, Lat. *fero*, Goth. *baira*, O. H. Ger. *piru*, Eng. *to bear*. 4. Sansk. *jñā*, Gr. *γνώμι*, Lat. *gnosco*, Goth. *kan*, O. H. Ger. *chan*, Ger. *kennen*, Eng. *to know*. 5. Sansk. *pād-as*, Gr. *ποδ-ός*, Lat. *ped-is* (*pes*), Goth. *fōt-us*, O. H. Ger. *vuoz*, Ger. *Fuss*, Eng. *foot*. 6. Goth. *hilpa*, O. H. Ger. *hilfu*, Ger. *helfen*, Eng. *help*. 7. Sansk.

kapla, Gr. *κεφαλή*, Lat. *caput*, Goth. *haubith*, O. H. Ger. *houpit*, Ger. *Haupt*, Eng. *head*. 8. Sansk. *trayas* (nom. pl.), Gr. *τρεῖς*, Lat. *tres*, Goth. *threis*, O. H. Ger. *drî*, Ger. *drei*, Eng. *three*. 9. Sansk. *panchan*, Gr. *πέντε*, Goth. *fims*, Eng. *five*. Sansk. *upari*, Gr. *ὑπέρ*, Lat. *super*, Goth. *ufar*, O. H. Ger. *ubar*, Ger. *über*, Eng. *over*.—For further information see the articles on the principal languages and dialects. On the races, see Zeuss, *Die Deutschen und die Nachbarstämme* (Munich, 1837); H. Müller, *Die Marken des Vaterlandes* (Bonn, 1837); F. H. Müller, *Die deutschen Stämme und ihre Fürsten* (5 vols., Berlin, 1840); Watterich, *Der deutsche Name Germanen* (Paderborn, 1870); Baumann, *Geschichte des deutschen Volkes in seiner Entwicklung zum National-Staat* (Leipzig, 1871 et seq.). On the group of languages, see Grimm, *Geschichte der deutschen Sprache* (Leipzig, 1848), and *Deutsche Grammatik* (4 vols., Göttingen, 1819-'37); Bopp, *Vergleichende Grammatik des Sanskrit, Zend, Griechischen, Lateinischen, Litauischen, Altlavischen, Gothischen und Deutschen* (6 vols., Berlin, 1833-'52; translated by Eastwick, London, 1862); Schleicher, *Compendium der vergleichenden Grammatik der Indogermanischen Sprachen* (Weimar, 1862); Heyne, *Grammatik der Altgermanischen Sprachstämme* (Paderborn, 1862); Marsh, "The Origin and History of the English Language" (New York, 1862); March, "Comparative Grammar of the Anglo-Saxon Language" (New York, 1870); and Helfenstein, "A Comparative Grammar of the Teutonic Languages" (London, 1870).

GERMANICUS CÆSAR, a Roman general, born in Rome, 15 B. C., died near Antioch in A. D. 19. He was the son of Claudius Nero Drusus and Antonia, the daughter of the triumvir Antony, and was adopted by his uncle Tiberius in accordance with the will of Augustus. His original names are unknown. In 7 he accompanied Tiberius against the rebels of Dalmatia, served with distinction during three campaigns, and on his return to Rome received a triumph and the hand of Agrippina, granddaughter of Augustus. At the close of another campaign, in 11, he was made consul, and in the following year was placed in command of the eight legions on the Rhine. He was absent in Gaul when upon the death of Augustus (14) a universal sedition broke out in the army. He was a favorite with the soldiers, and they had already determined to raise him to the head of the empire, when he suddenly returned to the camp, and at the peril of his life succeeded in repressing two successive revolts, and in establishing Tiberius upon the throne. He immediately marched the pacified legions against the enemy across the Rhine, and routed the Marci, whom he fell upon by night as they were celebrating a festival. Being soon after appointed commander-in-chief of all the legions of Germany, he began that series of exploits which gained him

his title of Germanicus. He marched against the native hero Arminius, the conqueror of Varus, defeated him, and made his wife Thusnelda prisoner; then penetrated to the Teutoburg forest, near the sources of the Lippe, the scene of Varus's disaster, and buried the bones of the legionaries who had fallen there. Yet Arminius hovered about the Roman army in impracticable places, attacked it in a narrow pass, and drove it into a marsh with so great loss that Germanicus decided to retreat to the Rhine. In the year 16 he returned against the Germans with a fleet of 1,000 vessels, landed at the mouth of the Ems, crossed the Ems and the Weser, and defeated Arminius first on the plains of Idistavisus and then in the vicinity of Minden. He determined thereupon to return, but he lost a part of his fleet in a storm, and his own vessel stranded on the shores of the Chauci. Fearing that his losses might embolden the Germans, he sent Silius against the Catti, while he himself attacked the Marci. He purposed to pursue his advantages in the following year, when Tiberius, jealous of his fame, recalled him, and in the triumph which was granted him Thusnelda figured among the captives. To rid himself of Germanicus, the emperor sent him to the East to fight the Parthians and to pacify Armenia. He at the same time gave the government of Syria to Cneius Piso, with secret instructions to thwart and annoy Germanicus. The latter hastened to Armenia, and placed the crown upon Zeno. He subsequently reduced Cappadocia to a province, and gave the command of Commagene to Servus. At the request of Artabanus, king of the Parthians, he removed Vonones, the deposed monarch, to Pompeiopolis. In the year 19 he visited Egypt without the special permission of the emperor, as required at the time. On his return to Syria he suddenly fell ill and died. Agrippina brought his ashes to Italy amid universal mourning; honors almost unexampled in Roman history were paid to his memory; and Piso, accused by the senate of having poisoned him, anticipated his condemnation by a voluntary death. Germanicus is the hero of the "Annals" of Tacitus, and is one of the noblest characters in the history of the Roman empire. He had reputation also as an orator and poet, but of several works which he composed there remains only a Latin translation of the *Phænomena* of Aratus, which is superior to Cicero's translation of the same work. He was the father of the emperor Caligula.

GERMAN IVY (*senecio scandens*), a house plant cultivated for its quick-growing, ivy-like foliage, but which is not properly an ivy. It is one of the composite family, and a native of the Cape of Good Hope. Its twining stems grow to the height of 8 or 10 ft., and are well clothed with round heart-shaped leaves, which have several pointed lobes, of a rather thin texture and a light green color. The plant is rarely seen in bloom, but it sometimes produces umbel-like clusters of small bright yellow flowers.





It grows readily from cuttings, flourishes well in the dry atmosphere of dwelling rooms, and is admirably adapted to window culture; in the

German Ivy.

open ground it is a useful climber where it is desired to cover a surface quickly, but it is killed by the first frost.

GERMAN OCEAN. See NORTH SEA.

GERMAN SILVER, or *Argentane*, an alloy resembling silver, made of variable proportions of its ingredients according to the uses for which it is designed. A composition of 8 parts of copper to 8 each of nickel and zinc is recommended as making a close imitation of silver of $\frac{168}{169}$. The two latter metals are also used in the proportions of 4 each to 8 of copper. By using a larger proportion of copper the alloy is more easily rolled into plates, but the copper sooner becomes apparent in use. Iron used in the proportion of 2 to 24 per cent. renders the composition whiter but more brittle. The genuine German silver, made from the original ore of Hildburghausen in Henneberg, analyzed by Keferstein, was found to consist of copper 40.4 per cent., nickel 31.6, zinc 25.4, iron 2.6.

GERMANTOWN, formerly a post borough of Philadelphia co., Pennsylvania, 6 m. N. W. of the state house, Philadelphia, and included since 1854 in the 22d ward of that city; pop. of the ward in 1870, 22,605. It has one main street, about 4 m. long, extending S. S. E. and N. N. W., which is intersected at right angles by several others. It is lighted with gas, is well supplied with water, and is connected with Philadelphia by both a steam and a horse railway. Many retired merchants and wealthy citizens of Philadelphia have here their residences, some of which are of great elegance. Among the public buildings are 21 churches, an academy and other schools, and a bank. There are also a number of extensive manufactories.—Germantown was laid out in 1684 under a grant from William Penn, and settled by

Germana, whence its name. It is memorable as the scene of the defeat of the American army under Washington by the British on Oct. 4, 1777. Washington, having learned that Gen. Howe had detached a portion of the main division of his army, then at Germantown, determined to take advantage of it to attack his camp. After marching all night, he entered the town about sunrise. The enemy, who were encamped across the main street at right angles, were taken by surprise, but the morning being dark and foggy, the Americans were thrown into confusion by the many small enclosures of the village, and the British rallied and attacked in turn. Some of the Americans were seized with a panic, and what had promised to be a victory was changed into a defeat. Washington withdrew in good order, with all his artillery. The British loss was upward of 600; the American about 1,000.

GERMANUS (Fr. *St. GERMAIN L'AUXEROIS*), a saint of the Roman Catholic church, born in Auxerre, central Gaul, about 380, died in Ravenna, July 31, 448 or 449. He was of a senatorial family, studied literature and jurisprudence, and distinguished himself for eloquence. He was made by the emperor Honorius military governor of his native district, and in 418 was elected bishop of Auxerre, although a married man. He separated from his wife, gave his property to the poor, and built a monastery on the river Yonne. He twice visited England at the request of Celestine I., and by his authority the doctrines of Pelagius were condemned and suppressed there, and schools for the education of the clergy were opened. He once led the Britons against a party of Picts and Saxons who were plundering the coast, and terrified them into retreat by a general shout of "Hallelujah," an action known under the name of the Hallelujah victory. He encouraged St. Patrick to undertake the conversion of the Irish, and in 447 went to Ravenna to mediate between the revolted Bretons and Valentinian III. His feast is celebrated on July 31. A manuscript preserved in the abbey of St. Gall, entitled *Liber Sancti Ambrosii in Laudem Sanctorum compositus*, is said by the Benedictine editors of St. Ambrose to have been probably written by St. Germanus. His life, written 80 years after his death by the priest Constantius, and put in verse by the monk Eric, is to be found in Labbe's *Nova Bibliotheca Manuscriptorum*. A new life of St. Germanus was given in vols. ix. and xi. of Newman's "Lives of the English Saints" (London, 1844).

GERMANY (Ger. *Deutschland*; Fr. *Allemagne*), formerly a large empire of central Europe, with an area at the time of the first French revolution of 267,714 sq. m., and 28,265,000 inhabitants. From 1806 to 1815 it was dismembered and disorganized. In 1815 the German confederation (*Deutscher Bund*) was established in the place of the old German empire, embracing part of Austria (the present

Cisleithania, with the exception of Galicia and Bukowina; see AUSTRIA), the bulk of Prussia (with the exception of Prussia proper and Posen), the kingdoms of Bavaria, Württemberg, Saxony, and Hanover, the electorate of Hesse-Cassel, and a number of grand duchies, duchies, principalities, and free cities; in all 39 states, which in 1866 had been reduced to 33. The area of this confederation was 243,539 sq. m.; the population in 1865, 46,412,536. In 1866 it was dissolved. Austria was excluded from Germany, and Hanover, Hesse-Cassel, Nassau, and Schleswig-Holstein, with Lauenburg and Frankfort, were annexed to Prussia; the states north of the Main were formed into the North German confederation under the headship of Prussia. The four South German states, Bavaria, Württemberg, Baden, and Hesse-Darmstadt, were made independent states, but were closely united with the North German confederation by means of the Zollverein and defensive and offensive alliances. Luxemburg and Liechtenstein were dismissed from all connection with the other German states. Thus the term Germany, from 1866 to 1871, designated the North German confederation and the four South German states, with an aggregate area of 204,719 sq. m., and a population in 1867 of 38,581,522. In January, 1871, the North German confederation and the four South German states united to reestablish the German empire, to which, by cession from France, the Reichsland of Alsace-Lorraine was added. This empire is bounded N. by the North sea, Denmark, and the Baltic sea, E. by Russia and Austria, S. by Austria and Switzerland, and W. by France, Belgium, and Holland (including Luxemburg). Its extreme northern point is on the frontier of the province of East Prussia, in lat. 55° 52' N.; its extreme southern point is in the Bavarian district of Swabia and Neuburg, lat. 47° 17'. From E. to W. it extends from lon. 22° 52', on the boundary of East Prussia and Russian Poland, to lon. 5° 45', on the line dividing German and French Lorraine. The area is 208,738 sq. m.; pop. in 1871, 41,058,189, or 197 to the square mile.—Stretching from the lofty summit of the Alps to the low beaches of the Baltic, from the picturesque and diversified countries of western Europe to the monotonous plains of the east, Germany encloses a rich variety of mountainous regions, terraced country, table lands, and fertile plains. Though mainly an inland country, it has good outlets to its numerous navigable rivers. Two great river systems, tributary to the North sea and the Black sea, meet in Germany, rendering it the centre of the interior commerce of the European continent. Its climate unites the characteristics of the surrounding countries, holding a mean between the extreme heat of the south and the extreme cold of northern Europe, between the excessive moisture of the western coast countries and the dryness of the eastern plains. Until recently its boundaries were but poorly protected; but the recovery

of Alsace and part of Lorraine, in consequence of the war of 1870-'71, restored to Germany a very strong position for defence, as now the Vosges mountains form the western frontier, and to the former bulwarks against an invasion from France, Metz, Coblenz, Saarlouis, Landau, and Gernersheim, a number of equally strong fortresses in Alsace and Lorraine have been added: Metz, Strasburg, Diedenhofen (Thionville), Bitsch, and Neu Breisach. On the south and southeast Germany is protected by the Alpine system and the maze of its projecting spurs, and the mountains separating it from Bohemia. The weakest point of Germany is the E. and N. E. frontier toward Russia. There the Russian territory enters like a wedge into the side of Germany, and the defence of its easternmost provinces depends on its military organization rather than on the three fortresses of Posen, Thorn, and Königsberg.—The vertical configuration of Germany presents three principal groups: the Alpine region south of the Danube, the elevated and terraced central portion, and the level northern country. 1. By the exclusion of Austria from Germany, the Alps have become the southern frontier, and only two comparatively small branches (the Algaun Alps between the Rhine and the Lech, and the Bavarian Alps between the Lech and the Salzach) belong to the German empire. 2. The terraced country of central Germany has its nucleus near the junction of the boundaries of Saxony, Bohemia, and Bavaria, about lat. 50°, in the Fichtelgebirge, the watershed of the tributaries of the Rhine, Danube, and Elbe. Thence a number of mountain chains of the secondary order radiate in all directions. To the southeast the Bohemian Forest, the frontier between Bavaria and Bohemia, runs nearly 150 m. in parallel rugged chains toward the Danube. Its highest elevation is the Arber, about 4,800 ft. To the northeast the Erzgebirge, the loftiest peaks of which rise to an elevation of 4,000 ft., forms the frontier between Bohemia and Saxony. On the right bank of the Elbe the mountains cluster in a group of sandstone formation (Saxon Switzerland and Lusatia); after which, assuming the name of Sudetic mountains (Riesengebirge, Glatzgebirge), they turn S. E., dividing Bohemia from Silesia, and extending to the head waters of the Oder, where they meet the Carpathians. They culminate in the Schneekoppe, upward of 5,000 ft. high. S. W. of the Fichtelgebirge the Franconian Jura sweeps to the Danube and along its northern bank in a westerly direction into Württemberg, where its long-stretched, sharply defined ridges and table lands are known by the names of Rauhe Alp, Swabian Alp, Aalbuch, &c. In S. W. Germany (grand duchy of Baden), near the head waters of the Danube, the mountain ridge of the Black Forest sets off at a sharp angle from the Swabian Alp in a northerly direction nearly parallel to the Rhine, and skirting the fertile bottom land

of its E. bank. The spurs of this ridge, extending as far N. as the Neckar river, there meet with the Odenwald (grand duchy of Hesse), which, by the Spessart and Rhön (N. W. frontier of Bavaria), and again by the Thuringian and Franconian forests, is connected with the Fichtelgebirge. The territory enclosed by these different ridges, being those sections of Bavaria and Württemberg N. of the Danube, nearly the whole of Baden, part of the grand duchy of Hesse, and a few of the petty Saxon duchies, is intersected by a number of lesser hill chains. Between this Franconian and Swabian mountain system and the Rhaetian Alps of Austria extends a vast level plain (southern Bavaria), bounded N. by the Danube, W. by the Iller, E. by the Inn and Salzach. The N. W. section of central Germany (always taking the Fichtelgebirge as the centre) appears like a labyrinth of hill chains, few of which attain a considerable elevation. The more important of them are: the Werra mountains, the Habichtswald, the Westerwald, the Taunus (Prussian province of Hesse-Nassau), the Eder hills, Egge hills, Rothhaar hills, and the Haarstrang (Prussian Westphalia). These are all between the Rhine on the west, the Main and Kinzig rivers on the south, the Werra on the east, and the Lippe on the north. The highest summit is the Astenberg in Westphalia, nearly 2,800 ft. high. N. of the Lippe only one other hill chain stretches in a N. W. direction nearly parallel to the Ems, viz., the Teutoburg forest, renowned in German history as the theatre of the conflict by which the rule of the Romans east of the Rhine was broken. E. of the Weser, the Weser hills run parallel to that river, while S. E. of them and N. of the Thuringian system the Hartz appears as an isolated mass of mountains, the highest summit of which (Brocken) reaches the height of 8,737 ft. On the left or western bank of the Rhine the Vosges, extending along the western frontier of Alsace, rise near Colmar to an altitude of about 4,700 ft., and their northern spurs in Rhenish Bavaria and Rhenish Prussia, called the Haardt, the Hunsrück, and the Hochwald, to about 2,700 ft. in the latter range. Further N. the Ardennes send into Rhenish Prussia the ridge of the Eifel (2,500 ft.) and the Hohe Venn. Northeastern offshoots of the Jura cross the southern frontier of Alsace. 3. The great plain of northern Germany extends over the entire breadth of the country N. of a line drawn from the Holland frontier to Osnabrück and Minden, thence E. S. E. to Leipsic, thence S. by E. to a point where the head waters of the Oder and Vistula approach one another. This vast plain, which at some former geological period has undoubtedly formed the bottom of the sea, is traversed only by two ridges of hills, none of which rise above 400 ft. One of these ridges extends from the lower Vistula W. to the Oder above Stettin; the other from Tarnowitz in S. E. Silesia along the Oder to lat. 52° N., then a little to the

north of that parallel through the Prussian provinces of Brandenburg and Saxony into Hanover.—Each of the seas by which Germany is bounded on the north has a peculiar coast configuration. While the coast of the North sea or German ocean is largely indented by deep bays (Dollart and Jade bays) or wide embouchures (Weser and Elbe), and its “marshes” are the richest and most fertile soil in all Germany, the shores of the Baltic form many extensive lagoons (Haffs), and are generally uninviting and sterile. The advantages which the formation of the shores of the North sea would seem to offer for the development of the maritime interests of Germany, are to a great extent neutralized by the fact that a series of sand banks, called *Watten*, stretch nearly all along the coast. Besides this, the island which commands the entrance of all German ports on the North sea (Helgoland) has been ceded to Great Britain.—Germany is intersected by many rivers. The principal river systems are those of the Danube, Rhine, Weser, Elbe, and Oder. The Danube, flowing from W. to E., has within the empire a length of 400 m. Its principal tributaries in Germany are: on the left or N. bank, the Altmühl, Nab, and Regen; on the right bank, the Iller, Lech, Isar, and Inn. The North sea receives the river systems of the Rhine (469 m. within Germany), the Ems (about 200 m. long), the Weser (400 m. inclusive of the Werra), and the Elbe (500 m. within the empire). The principal tributaries of the Rhine are the Ill, Nahe, and Moselle, on the left bank; the Kinzig, Murg, Neckar, Main, Tauber, Lahn, Sieg, Wipper, Ruhr, and Lippe, on the right. The Weser is formed by the confluence of the Werra and Fulda, and receives only a few tributaries (Werre, Aue, and Hunte on the left, Aller and Leine, Ocker, Wümme, and Geeste on the right). The Elbe has, next to the Danube, the largest river system. Its affluents in the empire are the Mulde, Saale, Jetze, Ilmenau, Schwinge, and Oste, on the left bank; the Black Elster, Havel and Spree, Stecknitz, Elde, and Stör on the right bank. Two thirds of the territory drained by rivers which flow into the Baltic sea belongs to the system of the Oder (about 500 m. within the empire), and its numerous tributaries, the Neisse, Weistritz, Katzbach, Bober, Ucker, and Peene on the left, the Klodnitz, Malapane, Weide, Bartsch, Warthe, Plöne, and Ihna on the right. Of the small river systems the following may be mentioned: the Eider (boundary between Schleswig and Holstein), about 105 m. long; the Pomeranian rivers Rega, Persante, Wipper, Stolpe, Lupow, and Leba; and the Vistula, which in Germany has a length of about 150 m. A number of canals connect several of the large river systems, but only a few of them can compare with the American canals. The most important is the Ludwigs canal, connecting the Danube with the Main (and through this with the Rhine), thus furnishing uninterrupted naviga-

tion from the North to the Black sea. The Rhône and Rhine canal connects the system of these two rivers by joining the Doubs and the Ill. The Bremervörde canal connects the Oste and Schwinge, tributaries of the Elbe; the Kiel canal connects the North and Baltic seas by the Eider, and the Strecknitz canal furnishes an outlet from the Elbe into the Baltic by the Trave; by the Finow and Müllrose canal the systems of the Elbe and Oder are connected.—The number of lakes in Germany is large, but most of them are inconsiderable. The following deserve to be mentioned: the lake of Constance (Bodensee), the banks of which belong to five different states, Baden, Württemberg, Bavaria, Austria, and Switzerland; Ammer, Würm, Chiem, and Königs lakes, in Bavaria; Feder lake, Württemberg; lake of Steinhude (*Steinhuder Meer*), in Hanover and Lippe; Zwischenahner Meer, in Oldenburg; lake of Plön, in Holstein; lake of Ratzeburg, in Lauenburg and Mecklenburg; the lakes of Schwerin and Mrititz, in Mecklenburg; Schwieloch and Scharmütz lakes, in Brandenburg; Damm and Plön, in Pomerania; Zarnowitz lake, in Pomerania and western Prussia; the Salt lake near Eisleben, in the Prussian province of Saxony; and the lake of Laach, in Rhenish Prussia.—The climate of Germany is temperate, and, considering the extent of the country, remarkably uniform, the greater heat of the lower latitudes being tempered by the greater elevation of the country and its Alpine character. On the great plain of northern Germany the districts exposed to the moist west and south-west winds have a more inclement climate than central Germany; while the southernmost districts, though drier, have less heat than more northern latitudes. The average decrease of the mean temperature, going from S. to N., is 1° F. in 52 m., and going from W. to E. 1° in 72 m.; measured by the vertical elevation, it is 1° in 256 ft. The mean annual temperature of Stralsund (lat. 54° 18' N., lon. 18° 5' 23" E.) is 46.4°; the mean temperature in summer 68°, in winter 29.8°. The mean annual temperature of the valley of the Rhine is 52°, of Thuringia 47.5°, of Silesia 47°, of all Germany 48.8°. The extremes of temperature in the country N. of the Alps are 95° above and 81° below zero. In an average of 10 years the Rhine had been frozen over 26 days during each winter, the Weser 80 days, the Elbe 62 days, the Oder 70 days. The atmosphere is pure and wholesome, and unfavorable to the development of endemic or hereditary diseases, except in the high Alpine valleys, where orotism prevails. Epidemics are generally less destructive in Germany than in the neighboring countries.—Of wild animals, the deer, hare, rabbit, fox, hamster (a kind of marmot peculiar to Germany), marten, badger, weasel, otter (rare), &c., are found nearly everywhere, stringent game laws preventing their destruction. A good breed of horses

is raised in Mecklenburg, Holstein, and Hanover; cattle raising is a most important branch of husbandry in Oldenburg, the N. W. part of Hanover, Franconia, and the Alpine country; sheep are raised extensively in Saxony, Silesia, and Brandenburg; Saxony furnishes the finest quality of wool; goats, mules, and asses are reared principally in the mountainous districts of the south; hogs in all states, but chiefly in the west. Large birds of prey (the eagle and vulture) are rarely found beyond the Alpine districts; fowl of all kinds, wild and domestic, are plentiful in all parts of the country. Germany has only a few species of amphibia; there are only two venomous kinds of snakes, *vipera berus* and *V. chersica*. Carp and pike are numerous in nearly all rivers and ponds, the salmon only in the larger rivers; sturgeon, cod, and sheatfish in the Elbe, trout in all mountain streams; herring and sardines in the Baltic and North sea. Oysters of good quality are obtained near the shores of Schleswig-Holstein, and pearl mussels in some rivers of the interior. The silkworm is not raised extensively.—Germany is rich in mineral products, and mining has employed there a great number of persons from the remotest times. Gold is found only in a few places in limited quantities (in the Hartz mountains and in the kingdom of Saxony); silver abounds in the Hartz and in southern Westphalia; iron is found in large quantities in nearly all the mountain ranges, the best qualities being those worked in Westphalia, Alsace-Lorraine, and Rhenish Prussia; excellent tin abounds in the Erzgebirge; lead in Saxony and upper Silesia; calamine and zinc in Silesia; cobalt in Saxony. Salt is obtained in quantities more than sufficient for domestic consumption in all the states except Saxony and Anhalt. The production of coal has been enormously increased within the last 40 years. The most extensive coal beds occur in Rhenish Prussia, Westphalia, upper Silesia, Saxony, and Anhalt. The N. W. districts have instead an abundant supply of peat. Sulphur, saltpetre, alum, vitriol, gypsum, chalk, ochre, emery, porcelain clay, graphite, marble, alabaster, and amber (on the shores of the Baltic) are found in different districts. Precious stones are comparatively scarce. Of mineral springs Germany has a great number, and several of them (Pyrmont, Ems, Wiesbaden, Selters, Homburg, Baden-Baden, Kissingen, Schwalbach, Salzbrunn, Warmbrunn, &c.) enjoy a world-wide reputation.—The soil on the whole is only of moderate fertility. Many tracts are exuberantly productive, but many others are almost as barren and sterile as the Russian steppes. The most fertile tracts of land in Germany and in Europe are the marshes on the shore of the North sea. Scientific agriculture has improved the natural condition of the soil in a high degree. All kinds of grain and fruit belonging to the temperate zone are raised: rye, barley, oats, potatoes, peas, and beans, everywhere;

maize principally in the south; wheat in the south and west; buckwheat in the north; millet in the southeast; rapeseed, poppy, anise, and cumin in the central and northwest districts. The largest grain fields are in Württemberg, the smallest in Mecklenburg. Bavaria, Württemberg, Saxe-Altenburg, Mecklenburg, Holstein, &c., produce a larger quantity of breadstuffs than is required for home consumption, while Saxony and some of the Saxon duchies import breadstuffs. Flax and hemp, madder, woad, and saffron are cultivated more in the south and central region than in the north. Tobacco is extensively raised (even for exportation to other tobacco-growing countries) on the upper Rhine, the Werra and Oder, and in Brandenburg. Excellent hops are furnished by Bavaria and Brunswick. Beets are raised in enormous quantities for the manufacture of sugar, and their cultivation has almost entirely superseded the grain culture in the Prussian province of Saxony, Anhalt, Hesse-Darmstadt, and S. Bavaria. Chicory, as a substitute for coffee, is raised in the country between the Elbe and Weser rivers. In garden culture Württemberg, Bavaria, Hesse, and the Saxon duchies hold the highest rank. The fruit raised on the banks of the Rhine and Neckar, in Saxony and N. W. Bavaria, is of the very best quality to be found anywhere. Peaches and figs ripen only in localities protected from the cold. The apples of Saxony are of the choicest kind, and are exported to Russia in large quantities. Marron chestnuts, almonds, &c., are raised in the S. W. states. Great attention is paid to the improvement of fruit. In all the states there are pomological societies, which from time to time hold national conventions. The culture of the vine extends to lat. 51° 30'. (See GERMANY, WINES OF.)—The three free cities excepted, the greatest density of population prevails in the principality of Reuss elder line (473 to the square mile), the kingdom of Saxony (442), the grand duchy of Hesse (288), and the duchy of Saxe-Altenburg (256). In the following states it exceeds the average: Württemberg, Baden, Brunswick, Saxe-Coburg-Gotha, Schwarzburg, Reuss younger line, Lippe, Anhalt, and Saxe-Weimar. In Prussia it is 184, in Bavaria 166. The number of large cities, proportionately to the population, is greater in Germany than in any other country except Great Britain, Belgium, and Holland. There is one city with more than 800,000 inhabitants (Berlin), two with more than 200,000 (Hamburg and Breslau), seven with more than 100,000 (Dresden, Munich, Cologne, Magdeburg, Königsberg, Leipzig, and Hanover), 22 with more than 50,000, and 50 with from 20,000 to 50,000. More than nine tenths (92 per cent.) of the population of Germany belong to the German race; the remainder, belonging principally to the Slavic race, is mainly confined to the eastern Prussian provinces. The entire number of Slaves in Germany is about 2,640,000 (2,450,000

Poles, 140,000 Wends, 50,000 Czechs), or 6½ per cent., of which number only about 50,000 are outside of Prussia. In the latter country there are also about 150,000 Lithuanians and Letts. The Danes, in Schleswig, number about 150,000, and the French, chiefly in Lorraine, 280,000. Except Ireland, no country of Europe has lost so large a number of inhabitants by emigration as Germany. From 1819 to 1855 the aggregate number of German emigrants was estimated at 1,800,000. The number of German immigrants into the United States from 1820 to 1872 amounted to 2,580,000. The Germans are usually classified into Low Germans and High Germans, or northerners and southerners. The dividing line may be drawn from lat. 50° 30' in western Germany to lat. 52° 30' on the eastern frontier, or along the course of the Sieg (a tributary of the Rhine) to the southern slope of the Hartz mountains, crossing the Elbe near its confluence with the Saale, then a little to the northward along the southern banks of the Havel and of the Warthe. In physical development the Germans are superior to either the Latin or the Slavic race. Their frame and their muscular development are strong, almost heavy. Among the lower classes of the rural and laboring population stoutness and strength often approach to clumsiness. Generally the northerners are taller and have better-shaped features and limbs than the southerners. The blonde complexion prevails only in the north; in central and southern Germany light or dark brown is more frequently found. In power of endurance the Germans are surpassed by the Slavic race, in agility by the Latin. The prominent features of the German national character are honesty, faithfulness, valor, thoughtfulness, perseverance, and industry. The Germans have largely promoted the progress of human knowledge. There is scarcely a single branch of science in which they have not excelled. In music, painting, and sculpture they occupy a very high rank among nations. The German artisan is valued for his dexterity and steadiness. The sectional and local diversities of character are very great in Germany. While the Protestant northerners have many characteristics in common with the Anglo-Saxon, the Catholic southerners approach in some important respects the Latin race, particularly in a certain preponderance of imagination over reason. The Low German assimilates far more readily to the English or American than to the Austrian or Swabian.—The culture of the soil in Germany is highly developed, and inferior only to that of England. The products of agriculture have been nearly doubled by the introduction of more rational methods of cultivation since 1816. All German states have agricultural colleges, some of which enjoy a world-wide reputation. The methods of cultivation are different in different portions of the country. The triennial and quadrennial rotations of crops are most in use. According to the first method,

winter grain is raised in the first year, spring grain in the second, and potatoes, pulse, or fodder in the third year; according to the second method, recommended by Thaer, a grain crop is always followed by a crop of fodder or pulse. In some of the northern states crops of grain are raised on a certain portion of the farm for several successive years, after which the field is allowed to lie fallow from three to seven years, according to the number of lots into which the farm is divided. In Mecklenburg agriculture approaches to horticulture, inasmuch as many different kinds of fruit are raised on little plots of ground, one by the side of another. The culture of forests is conducted upon a more scientific basis than in any other country. Having in former times thoughtlessly destroyed their forests, many German states have been compelled to replant them in order to satisfy the wants of agriculture and industry. In many states the forests mostly belong to government, and are as carefully kept as gardens; but even private owners are prohibited by law from wasting their forests without regard to the public good. The most extensive forests are found in central and southern Germany and in the eastern provinces of Prussia. The entire superficies of wood land in Germany is 52,939 sq. m., of which Prussia has 31,423, Bavaria 9,376, and Württemberg about 2,296.—Of all European countries, Germany has the oldest manufactures. In the last century it had fallen in regard to the extent of its mechanical pursuits behind England and Belgium, but within 50 years it has advanced rapidly, and is now in a fair way to recover its former position. As early as the 18th century Germany was celebrated for its cloth and linen manufactures, its glass wares, carved and chiselled wares, &c. In the 14th century the silk manufacture was introduced, and the first paper mill was established as early as 1390. During the 15th century Germany became celebrated for its watch manufacture. Printing works were established at Augsburg and the lace manufacture introduced into Saxony in the 16th century. At that time Germany was to Europe, in regard to industry and commerce, what England is now. The thirty years' war destroyed all prosperity for a long time. At the beginning of the 18th century German industry again flourished, principally in consequence of the immigration of the Huguenots expelled from France. Frederick II. of Prussia and Joseph II. of Austria strove to raise it to its former eminence, but the French revolutionary wars blighted it once more. Since then it has recovered the lost ground, principally by means of the *Zollverein*, a commercial union of German states, which was inaugurated in 1819 and gradually joined by the majority of the states. According to the constitution of 1871, the German empire constitutes one customs and commercial union, except a few small communes which on account of their situation remain excluded from the common

line of customs, and the two Hanse towns, Hamburg and Bremen, which as free ports may remain outside of the union "until they themselves demand admittance." Besides the states of the empire, the *Zollverein* embraces the grand duchy of Luxemburg and the Austrian commune of Jungholtz on the southern frontier of Bavaria. By the *Zollverein* free commerce was established among all its members, while a high tariff protected their industry against foreign competition. The progress made by Germany under this system is truly remarkable. While 50 years ago it had become preëminently an exporter of raw products of the soil, it is now one of the principal exporters of industrial products and importers of raw materials. The centres of German industry are the kingdom of Saxony, Westphalia, Rhenish Prussia, and Alsace-Lorraine. The linen manufacture stands highest in Saxony, Silesia, and Rhenish Prussia. The cotton industry of Germany has of late assumed very large dimensions. The number of spindles in 1869 was estimated at 5,000,000. The imports of cotton into the territory of the *Zollverein* were 2,271,000 cwt., of cotton yarn 313,264, and of cotton goods 28,700 cwt.; while on the other hand the exports of cotton were 936,397 cwt., of cotton yarn 66,861, and of cotton goods 198,562. How the woollen manufacture of Germany has been increased by the *Zollverein* may be seen from the fact that in 1825 Germany exported to England alone 280,000 cwt. of raw wool, while in 1869 the quantity of woollen yarn imported into Germany amounted to 800,000 cwt., and the quantity exported to 94,000, leaving not less than 206,000 cwt. as the net import of raw material. In the same year the quantity of woollen cloth exported amounted to 306,581 cwt. The German silk fabrics equal in quality the French and English, but are somewhat inferior in design. The principal silk manufactories are in Prussia (Berlin, Elberfeld, and Crefeld) and Saxony. The export of silk fabrics from Germany is nearly equal in amount to the domestic consumption. The paper manufacture has made considerable progress, although the finest qualities are still imported to some extent. In some fabrics of wood, as the choicest kinds of cabinet furniture, and all kinds of toys, Germany stands unequalled, and is a large exporter to all countries of the world. The iron manufacture has of late increased rapidly. The production of raw iron in the empire amounted in 1868 to 27,757,880 cwt. (21,065,199 in Prussia, 4,487,458 in Alsace-Lorraine, 961,882 in Bavaria), and in 1869 to about 33,000,000 cwt. The best iron and steel wares are manufactured in Rhenish Prussia and Saxony. The machine shops of Prussia, Saxony, Bavaria, and Baden rival, if they do not excel, the largest establishments of their kind in England. Other important branches of industry are gold and silver wares (Augsburg and Berlin), glass wares (Silesia), leather (Rhenish Prussia), por-

celain (Saxony and Berlin), mathematical and astronomical instruments (Munich and Berlin), clocks (Baden), &c. Brewing is one of the most extensive branches of industry, especially in Bavaria. There were in the year 1870-'71 in the empire (exclusive of Lorraine) 802 beet sugar manufacturing establishments (227 in Prussia, 85 in Anhalt, 25 in Brunswick, 5 each in the Thuringian states and Württemberg, 4 in Bavaria, 1 in Baden), which made 4,876,000 cwt. of sugar.—The foreign commerce of Germany is of great importance. The total value of imports in 1870 was estimated at \$408,200,000, of exports at \$345,600,000. The present customs law of the German empire bears date July 1, 1869; a new tariff was introduced on Oct. 1, 1870. All transit duties have been abolished; the duties on imports have been greatly reduced; of exports only rags are subject to a duty. The free towns, Hamburg, Bremen, and Lübeck, are the principal outlets of German commerce. Hamburg holds the third rank of all European ports, London and Liverpool only being superior. The income of the Zollverein in 1871 was \$22,900,000. The merchant navy of Germany is larger than that of any other country except England and the United States. It numbered in December, 1871, 5,122 vessels (of which 179 were steamers), of an aggregate tonnage of 1,305,000. The number of vessels entering the German ports in 1871 was 68,155, of 8,735,000 tons; the number of vessels cleared 67,471, of 8,864,000 tons. The principal articles of export are wool, hops, grain, cattle, linen yarn, skins and hides, glass ware, and antimony, to England; iron and steel wares, zinc, coal, lumber, hops, hemp, flax and seed, alcohol, and cattle, to France; grain, timber, coal, wine, leather, wool, metals, woollen and cotton fabrics, hosiery, hardware, china, and glass ware, to Holland; wool, wine, and salt, to Belgium; grain, salt, and brandy, to Switzerland; seeds, fruit, preserves, and sugar, to Sweden and Russia; linen and cotton goods, ribbons, and hosiery, to Italy, Spain, and Portugal; wine, cotton, woollen, linen, and silk goods, hardware, glass ware, toys, &c., to America. The imports are, besides all kinds of raw material (cotton, pig iron, copper, coal, &c.), coffee, sugar, rice, wine (from France and Hungary), cloth, laces, machines, the finer qualities of silk fabrics, jewelry, &c. The silver standard prevailed in Germany until the establishment of the empire, when the gold standard was adopted. The unit in the northern states was the *Thaler* (30 thalers to 1 Zollverein pound of silver, equal to 1.889 lb. avoirdupois); in the western the *Gulden Rheinisch* or *Rhenish florin* (52½ to 1 lb. of silver). The gold coins common to all Germany were the crown (50 to 1 lb. of fine gold) and the half crown; their value was regulated by commerce, and averaged about 9½ thalers (\$6.58) the crown. These coins will be received at their old value until Jan. 1, 1875, when they will be superseded. According to the new law

for the uniformity of the coinage throughout the empire, published in 1872, the gold coins of the empire will be in future the twenty-mark (69½ to 1 lb. of fine gold), ten-mark, and five-mark; the silver coins, the five-mark (20 to 1 lb. of fine silver), two-mark, one-mark, 50 pfennige (200 to 1 lb. of fine silver), and 20 pfennige; the nickel coins, ten pfennige and five pfennige; the copper coins, two pfennige and one pfennig. The French metrical system of weights and measures has been adopted, and made compulsory from Jan. 1, 1872.—The railways of Germany belong to the "Association of German Railway Companies," which was established in 1846, and also embraces various railways of the Austro-Hungarian monarchy and of the Netherlands. The aggregate length of the German railways in connection with the association which were in operation on Jan. 1, 1873, was 13,643 m., of which 8,482 m. belonged to Prussia, 1,910 to Bavaria, 767 to Württemberg, 689 to Baden, 708 to Hesse, and 513 to Alsace-Lorraine. The constitution of the empire obliges the particular governments to make the railways of their states a uniform part of the general German railway system, and authorizes the central government to build new roads even without the consent of the particular government, whenever the defence of Germany or the interests of the common traffic require it. The aggregate number of locomotives employed by the association in 1868 was 6,873; of tenders, 5,897. The total number of passengers carried was 117,000,000, and the aggregate earnings were \$166,000,000. The administration of postal affairs and telegraphs (except those of Bavaria and Württemberg) also belongs to the central government; the surplus of receipts over expenditures flows into the imperial exchequer. The German-Austrian and Luxemburg postal union also embraces the Austro-Hungarian monarchy; the German-Austrian telegraph union, the Austro-Hungarian monarchy, and the Netherlands. The aggregate length of the telegraph lines of the empire (inclusive of Bavaria and Württemberg) in 1871 was 22,788 m.; that of telegraph wires, 78,813 m.; the number of stations, 8,726; the number of post offices, 6,896. Regular steamboat lines are established on the Rhine (since 1827), Danube (1838), Elbe, Oder, Vistula, Main, and Moselle. There are two transatlantic lines of steamers from Hamburg, one from Bremen, and one from Stettin.—Politically Germany is divided into 26 states, 22 of which have a monarchical and three a republican form of government. The constitution of one (Alsace-Lorraine) was in 1873 not yet decided. The kingdom of Prussia embraces about two thirds of the area of Germany, and a majority of the population (24,600,000 out of 41,000,000). Besides Prussia there are three kingdoms, Bavaria, Saxony, and Württemberg; six grand duchies, Baden, Hesse-Darmstadt, Mecklenburg-Schwerin, Mecklenburg-Strelitz, Saxe-Weimar, and Oldenburg;

five duchies, Brunswick, Saxe-Meiningen, Saxe-Coburg-Gotha, Saxe-Altenburg, and Anhalt; seven principalities, Schwarzburg-Sondershausen, Schwarzburg-Rudolstadt, Lippe-Detmold, Schaumburg-Lippe, Waldeck, Reuss senior, and Reuss junior; three free cities, Lübeck, Bremen, and Hamburg; and the imperial territory of Alsace-Lorraine. The constitution of the German empire bears date April 16, 1871. At the head of the empire is the king of Prussia, who has the title of "German Emperor." The emperor represents the empire internationally, declares war, concludes peace, and enters into alliance and treaties with foreign powers. For a declaration of war the consent of the federal council is required, unless an attack has been made upon German territory. The emperor is the commander-in-chief of the imperial army and navy. He convokes, opens, adjourns, and closes the federal council and the Reichstag, but the former must be convoked whenever two thirds of its members demand it. The emperor promulgates the laws and superintends their execution. The legislative functions are vested in the federal council (*Bundesrath*) and the Reichstag. The members of the former are appointed by the governments of the states. It consisted in 1878 of 58 members: 17 for Prussia, 6 for Bavaria, 4 for Württemberg, 4 for Saxony, 3 for Baden, 3 for Hesse, 2 for Mecklenburg-Schwerin, 2 for Brunswick, and 1 for each of the others except Alsace-Lorraine. It has, according to the constitution, eight standing committees: 1, for the army and fortresses; 2, for the navy; 3, for tariff, excise, and taxes; 4, for trade and commerce; 5, for railways, posts, and telegraphs; 6, for civil and criminal law; 7, for financial accounts; 8, for foreign affairs. Since the annexation of Alsace-Lorraine, a 9th committee for that territory has been added. The committee for foreign affairs consists of the representatives of Bavaria, Saxony, and Württemberg, and those of two other states who are annually elected by the federal council, under the presidency of Bavaria. The emperor appoints the committees for the army and navy, except one member in the committee for the army, who is appointed by Bavaria; all the other committees are elected by the federal council. The Reichstag is elected by universal direct suffrage and by ballot, at the average rate of one deputy for every 100,000 inhabitants. It consisted in 1878 of 382 members: 286 for Prussia, 48 for Bavaria, 23 for Saxony, 17 for Württemberg, 14 for Baden, 9 for Hesse, 6 for Mecklenburg-Schwerin, 3 each for Oldenburg, Saxe-Weimar, Brunswick, and Hamburg, 2 each for Saxe-Meiningen, Anhalt, and Saxe-Coburg-Gotha, and 1 for each of the other states. The legislative period is three years. The Reichstag can be dissolved by a resolution of the federal council with the consent of the emperor. In case of a dissolution, the new election must take place within 60 days, and the convocation of the new Reichs-

tag within 90 days. The Reichstag cannot be adjourned without its own consent for a period exceeding 80 days, and not oftener than once during one session. It elects its president, vice presidents, and secretaries. Its members receive no pay or indemnity, are during the exercise of their functions free from responsibility, and enjoy the usual constitutional immunity. For an imperial law (*Reichsgesetz*) the agreement of the majority of the federal council and the Reichstag is requisite and sufficient. Such sections of the imperial constitution as provide for the rights of particular states can only be changed with the consent of the state concerned. States which fail to fulfil their federal duties can be coerced by means of an "execution," which is ordered by the federal council and carried out by the emperor. Disputes between states are decided by the federal council. The revenue and expenditures of the empire must annually be estimated and presented in the imperial budget. The expenditures of the empire are first met by the surplus of previous years, and by the income arising from customs, from the common branches of excise, and from the administration of postal affairs and telegraphs. If these revenues are insufficient, the balance is raised, as long as no imperial taxes are imposed, by contributions from the several states. The distribution is made by the imperial chancellor, who has annually to give an account of it to the federal council and the Reichstag. In the budget for 1878, the ordinary expenditures were estimated at \$79,560,000, and the extraordinary at \$5,900,000. The direct revenue was estimated at \$70,000,000, leaving a balance of about \$15,000,000 to be distributed among the states. The public debt on April 8, 1878, amounted to only \$1,224,000, which was soon to be paid off.—The military system of the empire is the same which has for many years been in operation in Prussia. Every German capable of bearing arms must serve for three years in the standing army, for four years in the reserve, and for five years in the landwehr. No substitution is allowed. The emperor is the commander of the entire German army in time of war, and, with the exception of the Bavarian troops, also in time of peace. All the German troops are bound to obey unconditionally the orders of the emperor; the Bavarian troops have this duty only in time of war. The emperor appoints (except in the Bavarian army) all the higher officers, orders the erection of fortresses in any part of the empire (in Bavaria and Württemberg with certain reservations), and in case of threatened disturbance of order can declare any country or district in a state of siege. The army of the empire is made up of the following contingents: 1, the army of Prussia, with which, in virtue of special military conventions, the troops of Oldenburg, Schwarzburg-Sondershausen, Lippe, Schaumburg-Lippe, Waldeck, Lübeck, Bremen, and Hamburg have been incorporated; 2, the contingents of Baden,

Hesse, Saxe-Weimar, the three Saxon duchies, Schwarzburg-Rudolstadt, and the two principalities of Reuss and that of Anhalt, the troops of which states are likewise by special conventions most closely united with the Prussian army, and have all their officers appointed by the emperor; 8, the contingents of the two grand duchies of Mecklenburg; whose officers are likewise appointed by the emperor; 4, the contingent of Brunswick; 5, the contingent of Saxony, forming a separate army corps; 6, the contingent of Württemberg, one corps; 7, the contingent of Bavaria, two corps. In time of war several corps are formed into an army, each army embracing from two to four corps. The army corps, both in peace and war, is subdivided into divisions, brigades, regiments, and battalions. In 1873 the army on the peace footing embraced 17,036 officers and 401,659 rank and file, with 96,158 horses and 1,198 guns; divided into 148 regiments of infantry, 26 battalions of chasseurs, 93 regiments of cavalry, 85 regiments of field artillery, 13 regiments of foot artillery, 19 battalions of engineers, 18 battalions of train, and 293 battalions in depots of landwehr. On the war footing the army numbered 31,006 officers and 1,276,526 rank and file, of whom 676,486 were field troops with siege train, 245,798 reserve troops, and 354,247 garrisons. The fleet of war of the empire consisted of 42 steamers (of which 5 were ironclads), of 45,070 horse power and carrying 277 guns, and 5 sailing vessels, with 94 guns; 8 additional steamers were in course of construction. The navy was manned by 8,840 seamen and boys, and officered by 1 admiral, 1 vice admiral, 3 rear admirals, 44 captains, and 237 lieutenants. Germany has four ports of war, Kiel, Dantzic, and Stralsund on the Baltic, and Wilhelmshaven in the bay of Jahde on the North sea.—Protestantism is professed by 62·3 per cent. of the population, Roman Catholicism by 36·2. The Protestants of the state churches, who are divided into Lutherans and German Reformed church, or united under the name of Evangelical church, in 1871 numbered 25,581,709; the free Protestant churches, as the Baptists, Methodists, Moravians, Free congregations, Irvingites, &c., number 114,000. In Prussia, the Protestants constitute 65 per cent. of the total population; in Alsace-Lorraine, 17; in Bavaria, 27; in Baden, 33; in Württemberg and Hesse, 68; in Oldenburg, 76; in Hamburg, 91; in all the other states, from 96 to 99. The Catholics have thus a majority in only three states, Bavaria, Baden, and Alsace-Lorraine. Of the German princes two, the kings of Bavaria and Saxony, are Catholics. The number of Old Catholics was estimated in 1873 at 55,000. The Jews number 499,000, or about 1·2 per cent.; they are most numerous in Hamburg, where they constitute 4·4 per cent.; they are 8·1 per cent. in Hesse, 2·7 in Alsace-Lorraine, 1·8 in Baden, 1·3 in Prussia, from 1 to 1·3 in Bavaria, Lippe, Waldeck, Anhalt, Lübeck, and Schaum-

burg, and less than 1 per cent. in all the other states. The Protestant state churches in all the larger and most of the smaller states have now a synodal constitution; only in a few of the latter the government still clings to the consistorial constitution, in virtue of which the church is wholly ruled by consistories appointed by the state governments. There has been since 1846 a bond of union for all the states (inclusive of Austria) in the Evangelical church conferences, consisting of delegates of the several church governments, who meet biennially for the discussion of the common interests of the German Protestant churches. An agitation for the convocation of an imperial synod (*Reichssynode*) has begun, and is gaining ground. The Roman Catholic church has five archbishops (Cologne, Posen, Munich, Bamberg, and Freiburg), 20 bishops, and three vicars apostolic. At the general meetings of the German bishops, the archbishop of Cologne presides. The Old Catholics in 1873 elected a missionary bishop for the German empire, who was recognized by the governments of Prussia, Baden, and Hesse as a bishop of the Catholic church.—There are 20 universities: Berlin, Bonn, Breslau, Erlangen, Freiburg, Giessen, Göttingen, Greifswald, Halle, Heidelberg, Jena, Kiel, Königsberg, Leipzig, Marburg, Munich, Rostock, Strasburg, Tübingen, and Würzburg. Each of these has the four faculties of theology, law, medicine, and philosophy. Breslau, Bonn, and Tübingen have two theological faculties, Catholic and Protestant; in Munich, Würzburg, and Freiburg, the theological faculty is Catholic, in all the others Protestant. Among the universities is sometimes also reckoned the academy of Münster, with two faculties, Catholic theology and philosophy. Munich, Würzburg, and Tübingen have each a faculty of political economy, and Tübingen one of natural sciences. Altogether the German universities in 1873 had 1,637 professors and 17,463 students. Germany has 10 polytechnic institutes, a number of theological schools, agricultural colleges, mining academies (Freiburg, Berlin, and Clausthal), and other special schools of every kind. There are 330 gymnasias, 14 *Realgymnasien*, 214 progymnasias and Latin schools, and 485 *Realschulen* and *Bürger-schulen* of a higher grade. Together, these secondary schools have 177,000 pupils. The number of normal schools is 190; of public primary schools, 58,000, with 5,900,000 pupils. On an average there are 150 pupils to every 1,000 inhabitants; this proportion is considerably exceeded in Brunswick, Anhalt, Oldenburg, Saxony, and the Thuringian states, but it is not reached in Mecklenburg and Bavaria. In all German states the attendance of all children at school for at least five years is made compulsory by law; and in some states, especially in central Germany and in Württemberg, those who are unable to read and write are very rare exceptions. Nearly all the capital cities have large public libraries, museums of art, scientific

collections, &c. Anatomical and mineralogical museums, zoological and botanical gardens, observatories, &c., are connected with most of the universities. The number of associations of scholars in all the different sciences is very great. The fine arts are as carefully fostered as science. Not even Italy is in advance of Germany in musical composition, many of the greatest composers of modern times being Germans, as Handel, Gluck, Mozart, Haydn, Mendelssohn, Beethoven, Weber, Meyerbeer, and Richard Wagner. In the art of painting the members of the two principal German schools, of Munich (Cornelius, Kaulbach, Piloti), and of Düsseldorf (Schadow, Lessing, Bendemann), rival the best artists of all times. In sculpture Rauch, Danneker, and Rietschel take rank with Thorwaldsen and Canova. German literature is exceedingly prolific, and contains a very great number of works of sterling merit. The number of new publications exceeded 9,000 annually from 1860 to 1868, and 10,000 from 1868 to 1873.—Of the earliest history of Germany no records remain. The Romans before the time of Julius Cæsar knew little or nothing of the people living E. of the Rhine and N. of the Danube, though some German tribes had invaded the Roman empire toward the end of the 2d century B. C. At the time of the conquest of Gaul, the Romans learned that the country beyond the Rhine contained a numerous people, who, although barbarians according to the standard of civilization of that time, had fixed settlements and were agriculturists. They were called Germani, either, as Strabo asserts, because they were nearly related (brothers german) to the inhabitants of Gaul, or, which is more probable, from the weapons they carried (*ger*, spear, *mann*, man). They were tall, light-haired, blue-eyed, warlike, and fond of independence, intoxicating liquors, and gambling, in which they often staked their personal liberty. Their chief occupations were hunting, care of cattle, and the use of arms. They were divided into nobles, freemen, and serfs. They paid peculiar respect to their women and the aged, and honored chastity not less than valor. They elected their chiefs, whom the Romans often call kings. They had priests, bards, and sacred groves, and worshipped or feared gods, demigods, and giants. Woden and his wife Fria or Frigg, Ziu, and Fro, were among their chief divinities. They believed in the immortality of the soul, or in life in Walhalla. Their sacrifices consisted of domestic animals, including horses, and sometimes of human victims. They had no cities, but mostly lived in hamlets, or small communities, which held several species of property in common. They were divided into more than 50 tribes, of which the following principally (though not simultaneously) figure in the history of the Romans: the Teutons, Ubii, Chauci, Catti, Rugii, Batavi, Usipii or Usipetes, Tencteri, Bructeri, Angriarii, Tribocci, Cherusci, Longobardi, Suevi, Goths, Marcomanni, Hermunduri, Burgun-

dians, Vandals, Gepidæ, Franks, and Alemanni. These tribes did not all live within the limits of the Germania proper of the Romans, which was bounded by the North sea and the Baltic, the upper Elbe, Danube, and Rhine. The districts S. of the Danube and W. of the Rhine, which became Roman provinces under the names of Rætia, Vindeïcia, and Noricum, and Germania Prima and Secunda (in Gaul), were mostly inhabited by non-German tribes, and often exposed to the incursions of the Germans. One of these incursions was headed by Ariovistus, who was driven from Gaul by Cæsar, in the first year of his Gallic campaigns. Cæsar and the generals of Augustus nominally subjected Germany; but when the Romans attempted to convert their nominal dominion into real possession of the country, they were ignominiously defeated, and Germany was liberated by the chief of the Cheruscan tribe, Arminius, A. D. 9. The subsequent expedition of Germanicus was of little avail. From that time the history of Germany is in part lost in vague traditions and in part connected with the history of the Roman empire for several centuries, until the country, over which the whole torrent of the great migration of nations had swept, became gradually united with the great Frankish empire of Clovis (481–511) and his successors. Among these Charlemagne, or Karl the Great (771–814), consolidated the empire by subjecting the Saxons, the last German tribes who had until then succeeded in maintaining their independence, and was in 800 proclaimed Roman emperor by the pope and the people of Rome. Charlemagne's rule extended from the Ebro in Spain to the Elbe in the northeast, the Raab (Hungary) in the east, and beyond the Po in Italy. He compelled the Saxons to become Christians, and introduced among them a feudal aristocracy and a strong temporal power of the clergy. The contest between these and the imperial power fills the history of Germany for centuries. The feeble successor of Charlemagne was unable to keep the vast empire together. In 843 it was divided between his three sons, Italy falling to the share of Lothaire, France to Charles the Bald, and Germany to Louis. The German kingdom was at that time bounded W. by the Rhine, E. by the Elbe, the Saale, and the Bohemian Forest, and S. by the Danube. The sons of Louis subdivided Germany into three lesser kingdoms, but these were reunited by Charles the Fat, and for a brief time even France was once more joined to Germany (882–887). Arnulf, a nephew of Charles, was elected German king, and was succeeded (899) by his son Louis, surnamed the Child, with whom the Carolingian dynasty became extinct (911). Germany at that time consisted of a number of great territories (duchies), the rulers of which, together with their most powerful vassals, elected the king, whose power, however, depended very much upon the good will of the dukes. The Fran-

conian, Conrad I. (911-918), unsuccessfully endeavored to make his authority respected by the mighty Saxon duke Henry, and on his deathbed entreated his subjects to elect the duke his successor. Henry I. (919-936) restored the empire by victories over the Danes, Slavs, and Magyars. His son Otho I. (936-973) extended the boundaries beyond the Elbe and Saale rivers, defeated the Magyars, who had invaded the country, so completely (955) that they never ventured to return, and conquered Lombardy. From that time the conquest of Italy became one of the principal aims of nearly all rulers of Germany. For many of them the barren honor of being crowned by the pope emperor of the Roman empire became the chief object of all their desires, to obtain which they allowed their power in Germany to be encroached upon more and more by the vassal princes. The Saxon dynasty ruled till 1024 (Otho II. 973-983, Otho III. 983-1002, Henry II. 1002-'24), and was succeeded by the Franconian. Conrad II. (1024-'39), an energetic and well-meaning man, conquered Burgundy for the German empire. His son, Henry III. (1089-'56), extended the German influence over the Slavic countries and Hungary, and succeeded for a time in maintaining the royal authority against all attacks of the aristocracy and hierarchy. But the youthful Henry IV., who succeeded to the throne in 1056, was unable to resist the power of the papacy, then at its zenith under Gregory VII., and was obliged to yield some of the most important prerogatives of the crown. His son, Henry V. (1106-'25), was the last ruler of the Franconian dynasty. After the brief reign of Lothaire II., the dynasty of the Hohenstaufen (Swabians) succeeded to the throne, and gave to the country five sovereigns: Conrad III. (1138-'52), Frederick I. (1152-'90), Henry VI. (1190-'97), Frederick II. (1215-'50), and Conrad IV. (1250-'54). Between Henry VI. and Frederick II., Philip of Swabia and Otho IV. of Brunswick reigned as rival kings, and after the death of Philip Otho alone. The reign of the Hohenstaufen dynasty represents the most glorious period of German history during the middle ages. Frederick I., surnamed Barbarossa (*der Rothbart*), still figures in the popular songs and traditions of Germany as the ideal emperor, the representative of German national power and splendor. To conquer Italy and to break the temporal power of the pope were the great objects of the emperors of this house. After a gigantic struggle, lasting nearly a century, they succumbed. From 1250 to 1273 anarchy prevailed in Germany. Several rival kings were elected (William of Holland, Richard of Cornwall, Alfonso of Castile, and Henry Raspe), but none of them obtained any authority. At last, in 1273, Count Rudolph of Hapsburg was elected king, and, by vigorously suppressing the feuds of the knights and barons, reestablished at least the semblance of

royal authority. At the same time he obtained for his family several important territories (Austria, Styria, Carinthia, Carniola, and Tyrol). After his decease (1291) Adolph, count of Nassau, was elected king by the dukes, who were jealous of the growing power of the Hapsburgs; but Albert, Rudolph's son, wrested the crown from him. Under Albert's reign (1298-1308) the Swiss cantons declared their independence of Austria. His successors were Henry VII. of Luxemburg (1308-'13), Louis IV. of Bavaria (1313-'47), Charles IV. of Luxemburg (1347-'78), who by a sort of written constitution (golden bull) defined and increased the power of the prince electors, Wenceslas or Wenzel (1378-1400), so miserable a ruler that it was found necessary to dismiss him, Rupert of the Palatinate (1400-'10), and Sigismund, brother of Wenceslas. During the reign of the latter the attempt of Huss to reform the doctrines of the church was the principal event. Huss was burned at the stake (1415), at the council of Constance, the emperor having ignominiously broken his pledge to protect him during his stay at Constance. This treachery provoked the bloody war of the Hussites. After Sigismund's decease (1437), the royal or imperial crown of Germany (the title of Roman emperor having gradually supplanted that of German king) remained continuously with the Hapsburg family. The energetic and liberal Albert II. (1438-'39) was succeeded by the inert and feeble Frederick III. (or IV., as Frederick the Fair, the rival of Louis the Bavarian, had borne the title of king as Frederick III.), who bore the royal title for more than half a century (1440-'98). His son, Maximilian I. (1493-1519), a chivalrous man of noble impulses, but lacking perseverance, organized the empire more systematically than had ever been attempted, but was unsuccessful in his efforts to establish a national army. Under his reign the reformation of the church was begun by Luther (1517). Once more Germany became the ruling power of Europe under Charles V., grandson of Maximilian, who united the crowns of Spain, the Netherlands, Germany, and Naples, and vigorously opposed the efforts of France to obtain control of Italy. But even during his reign the germs of civil and political dissension contained in the reformation of the church began to be developed in Germany. A formidable insurrection of the peasants, who longed for civil as well as religious liberty, was quelled with difficulty by the princes under the sanction of Luther, who was only too ready to scout the idea of an amelioration of the political condition of the people. The Protestant princes of northern Germany leagued themselves against the imperial authority, and though Charles defeated them (1547) by the aid of Maurice of Saxony, he was compelled by his former ally to grant important privileges to the Lutheran church (1552). In the mean time the bishoprics of

Toul, Metz, and Verdun had been wrested from the German empire by France. Disgusted with the successes of his adversaries, Charles resigned the crown. He was succeeded by his brother Ferdinand I. (1556-'64). The imperial authority was rapidly sinking to utter insignificance. France in the west and Turkey in the east were hovering on the borders of Germany, ready on every occasion to foster the internal dissensions of the empire and to conquer from it valuable possessions. The feeble Maximilian II. (1564-'76), the visionary Rudolph II. (1576-1612), and his brother Matthias (1612-'19), were unable to arrest the political decay. The thirty years' war (1618-'48), which devastated and impoverished Germany, destroying all industry and commerce, left the imperial authority completely shattered, and Germany cut up into a multitude of petty states, whose rulers were absolute monarchs in fact, if not in name. The persecutions perpetrated by Ferdinand II. (1619-'37) on his Protestant subjects almost equalled those of Philip II. of Spain. The peace of Westphalia (1648), concluded by Ferdinand III. (1637-'57), tore Alsace from the German empire. Under the pedantic and feeble-minded Leopold I. (1658-1705) Germany took part in the coalition against the rising power of France, but, although successful in war, did not obtain any signal advantages by the peace. From that time the title of German emperor appeared only as an empty surname of the rulers of Austria (Joseph I., Charles VI., Francis I., the husband of Maria Theresa, whose enemy, Charles Albert of Bavaria, was also crowned as Charles VII., &c.). In fact, Germany was merely a maze of little despotisms, among which a few larger states were endeavoring to obtain a voice in the councils of Europe. Prussia (a kingdom since 1701), through the genius of Frederick the Great, established a great Protestant power, able to cope with Austria, but at the same time anxious to prevent the reconstruction of a great united empire. Thus the attempts of the emperor Joseph II. (1765-'90, or rather 1780-'90, when he reigned himself) to reestablish the imperial authority in southern Germany were baffled by Prussia. At last the tempest of the French revolution prostrated the tottering fabric of the German empire. Vanquished by the armies of France, the emperor Francis II., son and successor (1792) of Leopold II., ceded by the treaties of Campo Formio (1797) and Lunéville (1801) the country on the left bank of the Rhine. The petty rulers who lost their possessions in this way were indemnified with the territories of ecclesiastical princes. In 1805 several states seceded from the empire and became allies of France; and when at last, in 1806, a number of German states formed the Rhenish confederation under the protectorate of Napoleon, the emperor Francis resigned the German crown, and the empire was formally dissolved. A number of the smaller territories

were annexed to the larger states, and most of the free cities, which while under the nominal authority of the emperors had enjoyed a sort of republican government, lost their independence. The efforts of Prussia to oppose to this confederation a North German league having been frustrated, nearly the whole of Germany, with the exception of Austria and Prussia, was reduced to a state of French vassalage. The minions of the emperor Napoleon ruled the country with an iron rod, and if they removed many of the most glaring remnants of feudal despotism, they introduced in their stead all the abuses of an irresponsible military régime, and carried their extortions to a frightful extent. The sums drawn from Germany by Napoleon under the designation of contributions or subsidies must be counted by hundreds of millions. The independence of the country was reestablished by the coalition of Austria, Russia, Prussia, Sweden, and Great Britain (1813-'15). A reconstruction of the old empire having been rendered impossible by the position which Prussia had assumed, a confederation was formed by all those states which had contrived to maintain their sovereignty during the Napoleonic troubles (June 8, 1815). Their number, which had exceeded 800 at the time of the dissolution of the empire, had then been reduced to less than 40, and a further reduction was made afterward by the extinction of several petty dynasties. The enthusiastic hope of the German people that Germany would once more appear as a powerful united nation was sorely disappointed. The diet, being only a permanent convention of the representatives of princes, all jealous of their individual sovereignty and unwilling to recognize the claims of the nation, became an abject tool of political oppression, and a harmonious coöperation of the states existed only in regard to repressive measures against all progressive movements. Wherever the people of a single state endeavored to obtain free institutions, the diet found occasion to interfere in favor of absolute monarchical power. None of the promises contained in the act of confederation in regard to a general tariff legislation, a common currency and postal system, &c., were fulfilled. Whatever was attained in this respect was due to the efforts of single states. Thus the Prussian Zollverein united a large portion of the German states on the basis of common material interests, and, by the great advantages it secured to its members, kept alive the longings for a still more complete national union. The French revolution of 1830 found an echo in some of the smaller German states, whose rulers were compelled to grant written constitutions to their subjects. A vigorous political life began to be developed in the southwestern states, and after the accession to the Prussian throne of Frederick William IV. (1840), in northern Germany also the demands of the people became more distinctly defined, while in Austria all popular aspirations were suppressed by the despotic rule of Prince Met-

ternich. Immediately on the downfall of the Orleans dynasty in France (Feb. 24, 1848), insurrections broke out in all the German states. The princes, unable to resist these movements, hastened to yield to the popular demands. A national congress of representatives of the people (German parliament) was convoked by a provisional self-constituted assembly (*Vorparlament*), and met at Frankfort, May 18, 1848. It formed a provisional national government, consisting of a vicar of the empire (*Reichsverweser*) and a ministry. Archduke John of Austria was elected vicar, June 29; but in spite of his professions of zeal for national liberty and union, it soon became evident that his principal aim was the frustration of all energetic action on the part of the parliament. Distracted by the troubles in Holstein, which Denmark endeavored to wrest entirely from its connection with the German confederation, the parliament made but slow progress in framing a national constitution. When at last the bill of rights had been agreed upon (December, 1848), the counter-revolution had already been victorious in Austria and Prussia, and it became apparent that these great powers would not submit to a constitution framed by the popular congress. Then a strong party began to advocate the exclusion of Austria from the new empire. This party, whose principal leader was Gagern, prevailed in the parliament, and elected the king of Prussia German emperor (March 28, 1849); but he declined the honor. Despairing of success, a number of members of parliament resigned their position, thus giving a majority to the democratic party, who elected a provisional regency of the empire, consisting of Raveaux, Vogt, Schtler, H. Simon, and Becher. Reduced to less than one third of its original number, the parliament adjourned to Stuttgart, May 30, 1849, and endeavored to raise a popular revolution in favor of the new national constitution. But only the people of Baden, a small part of Württemberg, and the Palatinate (Bavaria) followed the example of Saxony, which had already risen in revolution. The insurrection at Dresden had been suppressed after a sanguinary battle by Prussian soldiery; and the revolution in Baden, although successful for a few weeks, was likewise crushed in a brief campaign by the Prussian army (June). The rump parliament of Stuttgart had in the mean time been forcibly dissolved by the government of Württemberg. Having thus got rid of all revolutionary support, the Prussian government attempted to obtain the mastership of Germany on its own account. Austria, almost prostrated at the time by the Hungarian war, would have been able to offer little or no resistance to such a movement if carried on energetically and rapidly; but the Prussian government was no match for the bold and shrewd Prince Schwarzenberg, at that time the soul of the Austrian government. In March, 1850, Prussia assembled at Erfurt a new parliament of representatives

of those petty states which were too powerless to resist its demands, and a sort of federal constitution was adopted by it, but never obtained any real existence. To cut short all further attempts of Prussia, Austria convoked the old diet, which had been formally dissolved in 1848. Prussia refusing to recognize the diet, a hostile conflict between Austria and Prussia seemed almost inevitable. The armies of both were marching to Hesse-Cassel, and a skirmish of the outposts had taken place near Bronzell (Nov. 8, 1850), when suddenly the Prussian government lost courage and submitted to all the demands of Austria. The first fruits of the restoration of the diet were the intervention in Schleswig-Holstein in favor of Denmark, the abolition of the national bill of rights and of free constitutions in several of the smaller states, and the sale by auction of the national navy which had been created by voluntary contributions of the people during the revolution. While in these questions the influence of Austria prevailed, Prussia balanced its loss of political power by the enlargement of its commercial influence. Hanover became a member of the Zollverein (September, 1851), and was soon followed by Oldenburg and Schaumburg-Lippe. The efforts of Austria to enter the Zollverein, in order to destroy the Prussian influence even there, were successfully resisted by Prussia, but a postal and telegraph union of all German states was accomplished. During the eastern war (1853-'8) the German confederation followed a vacillating policy, swaying to and fro between Austria and Prussia. In April, 1854, those two powers concluded a treaty of alliance, guaranteeing to each other their respective possessions against all enemies whatever. The diet joined in this treaty July 24, and in December added another clause, promising the assistance of all Germany to Austria if its army of occupation in the Danubian principalities should be attacked. Preparation for war was resolved upon by the diet, Feb. 8, 1855. After that the position of Prussia toward Austria became more reserved, and Austria, despairing of active assistance on the part of the confederation, was compelled to relinquish its intention to take part in the war against Russia. In November, 1856, the diet adopted a resolution promising to assist Prussia in its attempts to reconquer Neuchâtel, but the proffered assistance was not required. In 1857 the interference of the diet was requested against the attempts of Denmark to merge the duchies of Holstein and Lauenburg completely in the Danish kingdom. After long hesitation and delay a resolution was adopted in 1858, by which the Danish government was compelled to submit its project of a new political organization to the legislative assemblies of the duchies. When, in the beginning of 1859, difficulties arose between France and Austria on account of the state of Italy, a violent anti-Napoleonic feeling

manifested itself in Germany. The Prussian government, though willing to defend Austria's German provinces, and even the Lombardo-Venetian kingdom, under certain restrictions, would not stir unless it should obtain the military leadership of all Germany, irrespective of all limitations contained in the act of confederation. After long and angry discussions the leadership was conceded to Prussia by the smaller states. A circular despatch of the Russian government, covertly threatening Germany if it should interfere in the Italian war, had no effect but the assumption by Prussia of a more defiant attitude toward France, and the issue of an order by the prince regent to mobilize two thirds of the Prussian army (June, 1859). A few days later, the Prussian delegate in the diet moved that two federal army corps under the command of Bavaria be stationed on the upper Rhine, and one Prussian corps on the Main, and that the 9th and 10th federal army corps be united with the Prussian army. This motion was followed by another, to the effect that the diet should appoint a commander-in-chief of the non-Prussian and non-Austrian army corps. Thus the German confederation appeared to be on the very point of waging war against France, under Prussian leadership, when all at once Austria, unwilling to sacrifice its preponderating influence in Germany to the doubtful project of preserving its Italian provinces, introduced in the diet a resolution to mobilize the whole federal army, and to appoint the Prussian prince regent commander-in-chief, subject to the control of the diet, or rather of Austria, the latter being always certain of a majority in the diet. This movement at once neutralized all advantages Prussia had obtained. And when the preliminaries of peace were agreed upon by the emperors of France and Austria at Villafranca, July 11, the dissension and jealousy between Austria and Prussia, those great impediments to German unity, were more apparent than ever before. A passage in the Austrian emperor's proclamation of peace, in which he asserted that his natural allies had forsaken him, and that the neutral powers would have imposed upon him less favorable terms of peace than were offered by his adversary, gave rise to an acrimonious correspondence between the Austrian and Prussian governments. The latter succeeded in proving that the assertion of the emperor had no foundation in fact, and that he had been purposely misled by false representations of the French ruler at the interview of Villafranca. This singular discovery did not render the feeling of Austria any more friendly toward Prussia. A paper war was carried on by the presses of southern and northern Germany, and while the governments of those petty states who had been the most forward in their hostile demonstrations against France were eagerly courting the favor of Napoleon III., the most sinister threats against Prussia came from Vienna, Munich, and

Carlsruhe. The opinion became prevalent that, Austria having been humbled by France, if a war for the conquest of the left bank of the Rhine should be waged by France against Prussia, the latter would not obtain any assistance either from Austria or the smaller German states. The hostility of the two great sections of Germany manifested itself in sanguinary riots in the mixed Prussian and Austrian garrison of the federal capital (Aug. 6-8). Feeble movements were initiated by the liberal party to arrest the progress of disunion, and to prompt the Prussian government to take the lead in reforming the federal constitution. But Prussia, disheartened and unwilling openly to oppose the influence of Austria, declined the destiny which the liberal party pressed upon it, and would promise nothing more than the promotion of liberal institutions by the power of its example. Austria, on the other hand, made some show of concessions to the popular wishes, in order to divide the current of the sympathies of the popular party in Germany. A committee was appointed by the emperor (August) to draw up a constitution on the basis of provincial representation for the Austrian empire. At the same time another movement was initiated in Bavaria, the object of which was the creation of a separate confederation of the central German states, as a third great power within Germany. The same idea had been promoted by Bavaria in 1850, and then led to confusion and disunion. Notwithstanding the discouraging conduct of the Prussian government, the liberal party of Germany on Sept. 16 established a national association, the *Nationalverein*, to agitate and promote in all the particular states the conversion of the confederation (*Staatenbund*) into one compact federal state with a national representation (*Bundesstaat*), under the headship of Prussia. Prussia in no way expressed approval of this project, but it soon took occasion to oppose in the federal diet the policy of Austria and its allies. It moved on Oct. 10 that the liberal constitution of Hesse-Cassel of 1831, which in 1852 had been abolished by the elector in an illegal way, be restored. The legislature of Hesse-Cassel fully approved of this proposition, but in the federal diet the Austrian influence led to its rejection. In May, 1860, the motion of Prussia for a reform of the military constitution of the German confederation was likewise rejected. The dissatisfaction which this attitude of Austria caused among the liberals of the central and southern states was somewhat mitigated by the publication of the new fundamental law in Austria, on Oct. 20, 1860, which appeared as a concession to constitutional principles. Prussia, on the other hand, greatly offended the liberals by the ultra-conservative principles professed by King William I., who on Jan. 2, 1861, succeeded his brother Frederick William IV. In December the Saxon minister Von Beust, one of the most ardent champions of greater national unity,

presented to Prussia a new project of the federal constitution, according to which a representation of the German nation at the federal diet was to be created by the establishment of an assembly of delegates chosen by the diets of the several states. Austria declared its readiness to accept this project, which gave to Austria and Prussia an equal number of delegates, if she should be allowed to enter the confederation with her entire territory. Prussia in a note of Dec. 20 declared it to be impracticable, and instead advocated the establishment of a federal state, on the plan which had been tried ten years before. This idea was promptly rejected by all the middle states in February, 1862, on the ground that it would involve the loss of their sovereignty. In August they united with Austria in submitting another plan of reform, according to which an assembly of delegates of the several German diets was to be convoked at Frankfort for the special purpose of deliberating on some reforms in the civil and commercial legislation of the German states. An assembly of liberal German deputies, held in September at Weimar, declared against this plan as wholly unsatisfactory, while on the other hand it was approved by the new national reform association (*Reformverein*), which in October was organized at Frankfort as the organ of those who unconditionally opposed the exclusion of Austria from Germany and the establishment of a Prussian leadership. In the federal diet, in January, 1863, it was defeated by a small majority. In the mean while the incessant conflicts between the Prussian liberals and their ultra-reactionary government had led, in September, to the entrance into the ministry of Otto von Bismarck, who soon after became its president and minister of foreign affairs. The uncompromising firmness with which he opposed the views of the Prussian diet on a reduction of the military budget filled even the Prussian friends of national unity with despair. Little was known of the ultimate plans of Bismarck with regard to German unity; but it was apparent that Prussia desired to be emancipated from the federal diet, and that her plans would henceforth be pushed with greater energy than at any previous time. The union movement was steadily gaining among the German people, and Austria made a bold bid for the continued headship in a reconstructed Germany. Francis Joseph invited the princes of all the German states, as well as the ruling burgomasters of the free cities, to a diet of princes (*Fürstentag*), to discuss the question of a new constitution. This assembly sat at Frankfort Aug. 17 to Sept. 1. The king of Prussia declined to attend it. The great majority of princes assented to the project of the emperor of Austria, according to which a directory of five princes (Austria, Prussia, Bavaria, and two others) was to be at the head of the nation, assisted by a federal council and a federal assembly of 800 members, which was to meet every third year.

Although Prussia was to have an equal number of deputies in the federal assembly, the presidency in the directory and federal council was to remain with Austria. The reform association declared for accepting the new constitution as a step in advance; while all the liberal parties of Germany decidedly rejected it. Soon a foreign complication turned the attention of all parties from the conflict of their schemes of reconstruction to a common defence of the German nationality. Frederick VII. of Denmark, in union with the predominant party of the country, had issued in March, 1863, a patent separating the duchy of Holstein from the common Danish monarchy, in order to unite Schleswig (which until then had been united with Holstein under one constitution) with Denmark proper. The federal diet summoned the Danish government to repeal the patent, as it encroached upon the right of Holstein, and thus of Germany, and threatened, in case of refusal, a "federal execution." On Nov. 15 Frederick VII. died, and was succeeded, according to the stipulation of the London conference of 1852, by Christian IX., who on Nov. 18 proclaimed the incorporation of Schleswig with Denmark. But as the federal diet had never recognized the London conference, the people of the duchies, as well as a number of the smaller German states, recognized Prince Frederick of Augustenburg as duke of Schleswig-Holstein. Public opinion throughout Germany strongly sympathized with this view, but Austria and Prussia decided to stand by the stipulations of 1851 and 1852, and insisted on carrying out the federal execution. The federal diet on Dec. 7, by 8 votes against 7, acceded to their demand and intrusted the execution to Hanover and Saxony. The German troops entered Holstein on Dec. 23, and the Danes withdrew without offering resistance. Prussia and Austria on Dec. 28 moved in the federal diet the occupation of Schleswig, in order to enforce the repeal of the law of Nov. 18. The motion was rejected, because the majority believed the question of succession would be prejudged by its adoption. In defiance of this resolution, Austria and Prussia declared that they would now act in the matter, not as members of the confederation, but as great powers of Europe, and at once (February, 1864) marched their troops into Schleswig. On Feb. 5 the Danes evacuated the strong Dannevirke, and withdrew behind the intrenchments of Düppel, which were stormed by the Prussians on April 18. A peace conference of representatives of the great powers, which met in London on April 25, remained without result. The Danes evacuated Jutland and confined themselves to the islands; but when the Prussians on June 29 occupied Alsen, they gave up all further resistance, and in the preliminary peace concluded in July ceded Schleswig, Holstein, and Lauenburg to Austria and Prussia. The cession, which was confirmed in the definitive peace of Vienna,

Oct. 30, was based entirely on the right of conquest, the question of the lawful succession in the duchies and the claims of the federal diet being ignored. When Prussia after the conclusion of peace called upon Hanover and Saxony to withdraw their troops from Holstein, Saxony showed some intention to resist by force. A collision was averted by a resolution of the federal diet, which in accordance with the demand of Austria and Prussia declared the execution to be ended. The disagreement between Austria and Prussia now began to widen. Austria desired to have the administration of the duchies transferred to Prince Frederick of Augustenburg; Bismarck entered into negotiations concerning the annexation of the duchies to Prussia. The federal diet took an unavailing interest in the cause of Prince Frederick, and finally confined itself to a protest against the illegal solution of the Schleswig-Holstein question, while the crown jurists of Prussia undertook to prove that Christian IX. of Denmark was the lawful duke of Schleswig-Holstein, which therefore, in virtue of the peace of Vienna, belonged to Austria and Prussia. A better understanding between Austria and Prussia appeared to be established when the latter power, in April, 1865, concluded a commercial treaty with the Zollverein. On Aug. 14 the Gastein convention gave Austria the exclusive occupation of Holstein, to Prussia that of Schleswig, and annexed Lauenburg to Prussia. The resolution of another general assembly of deputies of all the German states, which was held at Frankfort in October, and which demanded the convocation of the diet of Schleswig-Holstein, was entirely disregarded by the two great powers. Soon a new difficulty sprang up between Austria and Prussia. The permission given by the Austrian governor of Holstein, Gen. von Gablenz, to hold an anti-Prussian meeting at Altona, Jan. 23, 1866, led to a very angry exchange of diplomatic notes. Austria warned the other states against the ambitious schemes of Prussia in a circular note of March 16, and began to arm. As the states of the second rank did not conceal their entire sympathy with Austria, Prussia in April strengthened her position by an alliance with Italy, and also began to arm. At the same time Prussia made a bid for the sympathy of the masses of the people in the smaller states by moving in the federal diet, on April 9, the convocation of a general national assembly, to be elected by direct and universal suffrage. An understanding arrived at between Prussia and Austria to begin the disarmament on April 25 and 26 failed, as Austria refused to withdraw her army from the Italian frontiers. A peace congress, proposed by England, France, and Russia, likewise failed, because Austria demanded the exclusion of all negotiations concerning the extension of the territory of either disputant. On June 1 Austria transferred the decision of the Schleswig-Holstein question to

the federal diet. This was regarded by Prussia as a termination of the Gastein convention; her troops were at once marched into Holstein, and the Austrian governor of Holstein was invited to reënter into the joint occupation of Schleswig. Austria denounced this act as a violation of the federal constitution, and on June 14 the federal diet, by a majority of 9 against 6, adopted the view of Austria and ordered the mobilization of the entire federal army, except the troops of Prussia. The states voting for this resolution were Austria, Bavaria, Saxony, Hanover, Würtemberg, Hesse-Cassel, Hesse-Darmstadt, Nassau, and the small states forming the 16th class. The representative of Prussia at once declared that the majority of the federal diet had exceeded its authority, and that Prussia regarded the confederation as dissolved. On the following day, the governments of Hanover, Saxony, and Hesse-Cassel were requested by Prussia to take back their vote of the preceding day, to disarm, and to enter into a new confederation with Prussia, which in that case would guarantee their sovereignty; in case of refusal, the immediate opening of hostilities was announced. The three governments on the same day refused this demand, and on June 16 their territory was occupied by Prussian troops. The brilliant campaign of the Prussians (see PRUSSIA) against the Austrians, who had been joined by the Saxon troops, in Bohemia and Moravia (June 23 to July 22), and against the other federal troops in Thuringia and in the region of the Main (June 27 to the beginning of August), completed the dissolution of the confederation and secured the reconstruction of Germany on an entirely new basis. The preliminary peace of Nikolsburg, July 26, which was confirmed by the definitive peace of Prague, Aug. 23, excluded Austria from Germany, and provided for the establishment of a new confederation of the states N. of the Main. The states S. of the Main, Bavaria, Würtemberg, Baden, and Hesse-Darmstadt, were left at liberty to establish a South German confederation. Schleswig-Holstein, Hanover, Hesse-Cassel, Nassau, and Frankfort were incorporated with Prussia. Even before the conclusion of the definitive peace Prussia had entered into offensive and defensive alliances with Würtemberg (Aug. 18), Baden (Aug. 17), and Bavaria (Aug. 22). On Aug. 24 the last representatives of the old German confederation, who from Frankfort had removed to Augsburg, declared the work of the federal diet to be at an end. The North German confederation (*Norddeutscher Bund*) was established by treaties between Prussia and the smaller states during the period from Aug. 18 to Oct. 21. On Dec. 15 an assembly of plenipotentiaries met in Berlin to draft the constitution of the confederation, which was then submitted to the constituent North German Reichstag, which met in Berlin on Feb. 24, 1867, and on April 16 adopted by 230 against 53

votes the draft submitted to it. The king of Prussia, as president of the confederation, appointed Bismarck federal chancellor, and on July 1 the constitution went into operation. In February the South German states had held military conferences in Stuttgart to promote a greater conformity of their army organization with that of Prussia. Baden favored the adoption of the entire Prussian system; and when the other three states declined to go so far, though they admitted the desirability of greater uniformity, Baden concluded a special military convention with Prussia. Next to the adoption of the federal constitution, the most important event in the constituent Reichstag was an interpellation of Herr von Bennigsen, one of the leaders of the liberal party, concerning the right of Prussia to garrison the federal fortress of Luxemburg. The grand duchy of Luxemburg, which formed a part of the old German confederation, showed the most decided opposition to entering the new North German, and Prussia had given her consent for the grand duchy to remain outside of the reconstructed Germany. Soon after negotiations had been begun between France and Holland for a sale of the grand duchy to France, Prussia had entered an emphatic protest against this scheme, and on March 30 the king of Holland had officially denied any intention to sell Luxemburg. The full details of these negotiations only became known officially in consequence of the interpellation of Bennigsen, and created an extraordinary excitement throughout Germany. The expression of public opinion against the transfer of Luxemburg to France was no less decided in the south of Germany than in the north. The grand duchy of Hesse concluded in April a military convention with Prussia, in virtue of which its military system was reorganized according to the Prussian, and the Hessian troops were placed under the chief command of the king. Württemberg also introduced several features of the Prussian system. No doubt could be entertained that, in case of war, northern Germany might safely rely on the support of all the South German states. But a conference of the powers which had signed the London treaty of 1839 found a peaceable solution for the Luxemburg question. The grand duchy was declared neutral territory under the guarantee of all the powers represented at the conference; and the federal fortress was to be razed. This peaceable solution was hastened by the declaration of Bismarck that if the result of the conference should not be favorable to the preservation of peace, he would at once mobilize 900,000 men. On May 28 the ministers of the South German states were invited by Prussia to come to Berlin in order to put the Zollverein's treaty on a safe basis. An agreement was arrived at, according to which, for the legislation on affairs of the Zollverein, the South German states would send a specified number of members to the North German fed-

eral council, and order the election of a proportional number of deputies, who in union with the North German Reichstag would constitute the customs parliament. A new attempt of Napoleon to muddle in the progress of German reconstruction by demanding that, in accordance with one article of the treaty of Prague, the people of northern Schleswig be allowed to express by a plébiscite their preference for Denmark or Germany, was sharply repelled by Prussia, Bismarck declaring that Prussia was unwilling to recognize the right of France to watch over the fulfilment of the treaty of Prague. An interview of Napoleon with the emperor of Austria in August was looked upon as a threatening movement against Germany, and not only the North German states, but even the Germans of Austria, strongly expressed themselves against the endeavors of France to interfere in any way in the internal affairs of the German nation. In the grand duchy of Hesse, the second chamber demanded that the entire grand duchy, instead of only the northern portion as hitherto, be admitted into the North German confederation. In Baden both the government and the chambers expressed a wish to enter the confederation. Bismarck issued a circular note on the demonstrations of public opinion, which he declared to be significant proofs that the national feeling of the Germans would never brook a foreign interference in German affairs, and would never allow the development of the affairs of the German nation to be guided by any other considerations than the national interests of Germany. But while South Germany gave no encouragement to the schemes of Napoleon against the progress of German unity, there remained a widespread dissatisfaction with the policy of Prussia, and an unwillingness to tighten the bonds of union. At the election for the first German customs parliament, the South German party, which opposed any advances toward a closer union, elected 50 out of 89 South German deputies. Even in the grand duchy of Baden it met with an unexpected success. When, in reply to the opening speech of the king of Prussia, the national liberal party moved an address which asked for an enlargement of the functions of the customs parliament, and distinctly hinted at the complete union of north and south, the ultra-conservative feudal party of Prussian deputies, the radical party of progress (*Fortschrittpartei*), the Catholic party, and the socialists united with the South German party and caused its rejection by 186 against 150 votes. The conciliatory but firm attitude of the Prussian government prevented the progress of the centrifugal sentiments in South Germany. The governments of Bavaria and Württemberg, although disinclined to make further concessions on the union question, were on the other hand no less unflinching in the observance of the treaties which regulated their relation to northern Germany. Baden,

on May 25, 1869, concluded a new military convention with Prussia, which established an entire uniformity between the armies of Baden and Prussia. The North German Reichstag expressed a decided opinion in favor of restricting the right of particular states and enlarging the functions of the central authorities. The first six months of the year 1870 were unusually quiet, and it was the common opinion that great changes in the relation of the four South German states to the North German confederation were not likely to be made for a long time to come, when suddenly the action of France precipitated the final solution of the German question. The Spanish crown having been offered to Prince Leopold of Hohenzollern, and rejected, the emperor Napoleon demanded the guarantee of Prussia against its acceptance at any time thereafter by any prince of its house. This being scornfully refused, war was at once declared by France (July 19, 1870), and, after a brilliant series of victories for the Germans and almost uninterrupted defeats for the French, was in effect concluded by the preliminary peace of Versailles, Feb. 26, 1871. (See FRANCE.) In this war all the states both of North and South Germany, except Austria, participated; and in view of the common danger through which all had passed, and the common victory which all had won, the governments and the people of South Germany now waived any further opposition to a consolidation of all the German states under the leadership of Prussia. On Nov. 15, 1870, a treaty was concluded between the North German confederation, Baden, and Hesse concerning the establishment of the German confederation (*Deutscher Bund*); on Nov. 28 the entrance of Bavaria into the confederation was regulated by treaty; on Nov. 25, that of Württemberg. Bavaria asked and received important concessions, which to many unionists appeared to be going too far in favor of particularism; but the treaty was unanimously ratified by the federal council of the North German confederation, and by the Reichstag by 195 against 32 votes. On Dec. 8 the king of Bavaria invited the king of Prussia to restore the dignity of German emperor; most of the other governments gave their assent to the proposition before Dec. 8. In the name of the federal council the federal chancellor on Dec. 9 moved in the Reichstag, and the motion was adopted on the following day, that the German confederation assume the name German empire, and the king of Prussia, as president of the confederation, the title emperor of Germany. On Jan. 18, 1871, the restoration of the imperial dignity was solemnly proclaimed by the king of Prussia at Versailles; on March 21 the first German Reichstag assembled at Berlin, and was opened by the emperor in person. On April 14 this Reichstag ratified the constitution of the German empire, with but three dissenting votes; and on May 4 the constitution went into

operation. By the peace of Versailles Germany recovered the province of Alsace and the German-speaking district of Lorraine. The definitive peace was concluded at Frankfurt on May 10, and on June 9 the new *Reichsland* of Alsace-Lorraine was proclaimed as incorporated with Germany. The majority of the Reichstag, in full harmony with the imperial government and the majority of the federal council, was intent upon consolidating the new empire by centralizing the legislation and extending the functions of the central authorities. As two German states, the grand duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz, were still without a constitutional government, the Reichstag on Nov. 8 adopted the resolution of the deputy Büsing that every German state must in future have a constitutional form of government. On Nov. 15, on motion of Lasker, it was resolved to embrace the whole of the civil law within the sphere of the imperial legislation. Of the political parties which opposed the advancing consolidation of the empire, by far the most powerful was the Catholic, or the centre, as it was called from the central seats which its representatives occupied in the Reichstag. On the opening of the first session of the Reichstag, in March, 1871, they moved an amendment to the address by which the Reichstag was to reply to the speech from the throne, asking for the protection of the temporal power of the pope. On this question the other parties united against them almost unanimously, and the address moved by the majority of the Reichstag was adopted by 243 votes against 63, the minority consisting of the Catholic party and a few socialists. The conflict between them and the imperial government became more intense in 1872. One expression in a speech which the pope had made on June 25 was regarded by the majority of Germans as a direct wish for the overthrow of the empire, and intensified the sore feelings which had been produced by the pope's rejection of the cardinal prince Hohenlohe, whom the German government wished to appoint as minister at the papal court. As it was a common opinion that the religious excitement prevailing in the Catholic districts of Germany was largely due to the influence of the Jesuits, the Reichstag and federal council adopted in June a law which provided for the suppression of all the houses of the Jesuits and of affiliated orders. This law, which toward the close of the year 1872 was gradually executed, did not define which other religious orders were comprised within its terms; but the Redemptorists, Lazarists, ladies of the Sacred Heart, and a few others shared at once the fate of the Jesuits. The bishops of Germany assembled in November in a general conference at Fulda, and bitterly complained of this persecution; and the pope, in an allocution made in December, in terms still more severe, denounced the impudence of the anti-Catholic legislation, to which

the imperial government of Germany replied by breaking off all diplomatic intercourse with the papal court. Thus the relation between the Catholic church and the imperial government at the beginning of 1873 was one of open war. This was particularly the case in the kingdom of Prussia, where the relation between church and state was regulated by a number of new laws which all the bishops positively refused to obey. The government then imposed heavy fines upon the bishops, and in many cases withdrew the support which the ministers and institutions of the church had received from the state government. An interesting correspondence on the subject took place between the pope and the emperor. The pope expressed the hope that the cruel laws against the church did not meet the approbation of the emperor, and asked for his personal interference in behalf of the church; to which the emperor replied that in a constitutional state like Prussia every law required the sanction of the sovereign, and that the former peace between the different Christian churches had been wantonly disturbed by the unlawful conduct of the bishops. A germ of new difficulties between the state governments and the Catholic church was the legal position claimed by the Old Catholics, who maintained that the pope and the bishops who adhered to the decree of the Vatican council had abandoned the Catholic church, and that they alone were entitled to be regarded as the true representatives of that Catholic church which in Germany until 1870 was regarded as one of the state churches. Although the state governments, in view of the comparatively small number of the Old Catholics, declined to accept their view of the ecclesiastical situation, they at the same time refused to treat them as seceders from the Catholic church, and took the ground that the movement was an internal affair of that church, with which the state had no right to meddle. In Prussia, the missionary bishop of the Old Catholics was accordingly recognized in October, 1873, as a bishop of the Catholic church, and as such he at once received a salary from the state. The political changes in France greatly encouraged the hopes of the Catholic opposition in Germany, and in several southern districts of Bavaria led to threatening demonstrations against the very existence of the German empire. As a similar effect was produced by the political attitude of the French government in Italy, the visit of the king of Italy to Berlin was enthusiastically hailed by the liberal parties, both in Italy and in Germany, as an indication that the two governments intended to act in full concert against the common enemy. The relations between the governments of the smaller states and the emperor up to the close of 1873 were friendly, and no serious discrepancy of opinions on any important subject was shown in the deliberations of the federal council.—Among the best historical works on Germany are K. A. Menzel's *Ge-*

schichte der Deutschen (8 vols., 1815-'22), and *Neuere Geschichte der Deutschen* (12 vols., 1826-'48); Luden's *Geschichte des deutschen Volkes* (to the 13th century, 12 vols., 1829-'39); and Giesebrecht's *Geschichte der deutschen Kaiserzeit* (vols. i.-iii., 3d ed., 1862-'8).

GERMANY, Language and Literature of. The formation, the history, and the philological affinities of the German tongue have been treated at length in the article GERMANIC RACES AND LANGUAGES, and we shall therefore restrict our remarks in this article to a brief sketch of the modern High German language as now spoken and written. In this the five vowels, *a*, *e*, *i* (*y*), *o*, and *u*, sound as in Italian, the sound being lengthened by doubling the vowels: *ā* (or *ae*), when long, is like *a* in *mate*, when short almost like *e* in *met*; *ō* (*oe*), long, is like but somewhat duller than the French *eu* in *feu*, when short it resembles the English *u* in *tub*; *ū* (*ue*) is also duller than the French *u* in *sur* and *turc*. *O* before *e* and *i* (*y*), and *z* always, stands for *tz* or *ts*, as in English *pets*; *ck* for *kk*, as in English *peck*, *suck*; *g* is always hard, generally as in *get*, *give*, but sometimes almost like German *ch*, as in *ewig*, *weg*; *h* before a vowel has the same sound as in our *has*, *hen*; *ch* is harsher than *h*, and like the Greek *χ* or the Spanish *jota*; *j* sounds like *y* in *yes*; *r* is always whirring; *v*, in German words, has the sound of *f*, and in foreign of the English *v*; *w* sounds like English *v*. *S* has a threefold sound: 1, like the Latin *s*, in the combination *st*, at the end of a syllable, as *fest*, *Fürst*, and in forms derived therefrom, *festest*, *Fürsten*, &c., at the end of words, as in *das*, *gutes*, &c., and when double, as in *nass*, *Wasser*, &c.; 2, much like the English *z*, at the beginning of words, before vowels, and between vowels, as in *Sonne*, *dieser*, &c.; 3, like the English *sh* in *shell*, at the beginning of words before some consonants, as *Scandal* (Latin), *spät*, *still*, &c., though in a part of Germany it is pronounced like the English *s* in *sea*. *Sch* is like the English *sh* in *shell*. *Se* stands for *ss* after long vowels or at the end of words, and is thus written also in derivative forms, as *mass* and *miss* from *messen*. *ai* is pronounced like the English *ay* (*yes*); *au* like *ou* in *our*; *ei* (or *ey*) like *i* in *mine*. *Eu* has a very peculiar sound, approaching the English *oi*, and *äu* is somewhat heavier. *E*, the weakest sound, is most frequently employed: 1, for filling up the transition between consonants, thus, *er liebet* for *liebt* (the latter form is now more common); hence it is often elided, as *nah'n* for *nahen*, as in English *pow'r* for *power*, *heav'n* for *heaven*; 2, for lengthening *i* when that letter precedes it, as in *wieder*, again, distinguishing it from *wider*, against, counter; 3, as a mark of the plural, as *Steine*, stones, from *Stein*. *H*, the weakest consonant, is also used for lengthening a preceding vowel, as in *sehr*, *wohl*, &c. Besides *a*, three dentals and three liquids serve for all grammatical inflections. They are *d*, *s*, *t*, and *m*, *n*, *r*; *s*, *m*,

n, *r* are employed with nouns, *d*, *e*, *t*, *n* with verbs. The following is a synopsis of all grammatical endings attached to words: nominative (of the definite article) *der*, *die*, *das*, plural *die* for all genders; genit. *des*, *der*, *des*, plur. *der*; dat. *dem*, *der*, *dem*, plur. *den*; accus. *den*, *die*, *das*, plur. *die*. These are the endings of adjectives, nouns, and adjective pronouns. Comparative *dicker*, superl. *dickeſt*; receiving the preceding endings when declined. Endings of substantive nouns: singular genit. *es* or *s*, as *Dorf-es*, or like the nominative; dat. *e*, or like the nominative; plur. *e*, dat. *en*—new declension everywhere *en* or *n* (*des Falken*, &c.). Some substantives take *r* after *e* in the plural, and undergo metaphony, as in *Bad*, *Bäder*, *Volk*, *Völker*, *Tuch*, *Tücher*. The verbal endings are as follows: 1. Strong verbs (commonly called old conjugation): indicative present, *e*, *est* or *st*, *et* or *t*; plural, *en* or *n*, *et* or *t*, *en* or *n*; past, first and third persons have no ending, second *est*, or *st*; plural, *en*, *et*, *en*; imperative singular, first person wanting, second and third *e*; plural, *en*, *et* or *t*, *en*; participle past, prefix *ge*, suffix *en*. 2. Weak verbs (improperly called regular, really inorganic conjugation) have the same terminations as the preceding, except in the past tense, where *et* or *t* is inserted between the stem and the ending; participle past, prefix *ge*, suffix *et* or *t*. In both the ending of the participle present is *end*, infinitive *en*. The subjunctive of both has the endings always preceded by *e*, and the past of the strong verbs undergoes metaphony, as *ich gab*, I gave; *ich gäbe*, I might give. The strong verbs, whose conjugation is called irregular, exhibit the phonetic vicissitudes of words, and are therefore to be regarded as organic and containing the rules of the language; while the so-called regular verbs are weak, undergo no change, and only admit of mechanical additions.—All words of Teutonic physiognomy have the accent on the radical syllable; those taken from or resembling French, generally on the last effective syllable; and those from other languages on that syllable which to the German ear seems to be the radical; thus: *Empfindlichkeit*, sensibility; *unzuverlässlich*, untrustworthy, &c.; but *Regiment*, *Solidarität*, *Kapitän*, &c. The German language has in a very high degree three qualities which render it both very plastic in its material and very flexible in its adaptability to all forms and categories of thought. These qualities are: 1, intuitiveness of expression, owing to the organic etyma of the Indo-European family of languages, which are clearest in the Latin (see LANGUAGE); 2, facility of composition of simple words into double or manifold agglomerates, requiring long paraphrases in other languages; 3, power of polysyllabic derivatives from radical words. These latter qualities do not impair the first.—Among the most eminent of the founders of German philology are Benecke, J. and W. Grimm, and Lachmann. See J. Grimm, *Deutsche Gramma-*

tik, comprising also the Scandinavian branch (Göttingen, 1819-'37); Hoffmann von Fallersleben, *Deutsche Philologie im Grundriss* (Berlin, 1836), with a bibliography of dialects; Pischon, *Denkmäler der deutschen Sprache* (6 vols., Berlin, 1838-'51); Wackernagel, *Deutsches Lesebuch* (8 vols., Basel, 1839-'43); J. Grimm, *Geschichte der deutschen Sprache* (Leipzig, 1848). For grammars of new High German, see Ickelsamer (about 1525); Albertus (1573); Oelinger, *Unterricht der hochdeutschen Sprache* (1574); Clajus, *Grammatica Germanica Lingua* (1578); Martin Opitz, on German prosody (1624); Schottel, *Deutsche Sprachkunst* (1641); Morhof, *Unterricht von der deutschen Sprache und Poesie* (1682); Bödiker, *Grundsätze der deutschen Sprache* (1690); Braun (1765); Heynatz (1770); Basedow (1759); Bodmer (1775); Fulda, *Grundregeln der deutschen Sprache* (1778); Adelung (1781-'2); Heinsius (1798); J. Ch. A. Heyse (1814); K. F. Becker (1829). For dictionaries, see Frisch, *Teutsch-lateinisches Wörterbuch* (1741); Adelung (1774-'86); Moritz, *Grammatisches Wörterbuch der deutschen Sprache* (1793); Campe, *Versuche deutscher Sprachbereicherung* (1791-'4), and *Wörterbuch zur Aufklärung und Verdeutschung der unserer Sprache aufgedruckten fremden Ausdrücke* (1801; modified by Brandt, 1807-'13); Heyse, *Allgemeines Wörterbuch zur Verdeutschung*, &c. (1804); Heinsius, *Volksthümliches Wörterbuch* (1818-'32); Adler, *German and English* (New York, 1848); K. W. L. Heyse (1838-'49); J. and W. Grimm, a gigantic work, begun half a century ago, and not yet completed. On synonyms, see Gottsched, *Beobachtungen über den Gebrauch und Missbrauch vieler deutscher Wörter* (1758); Heynatz (1795); Eberhard (1802); Maass, Wiegand, Ch. F. Meyer, &c.—GERMAN LITERATURE received its first impulse from the fondness of the early Germans for celebrating in song the fabulous and heroic associations of their traditions and history. The legends immediately connected with Gothic, Frankish, and Burgundian warriors of the period of national migration were eventually embodied in the lay of the *Nibelungen*, the most celebrated production of German mediæval poetry. The spirit of the *Nibelungen* is essentially pagan and mythological. Christian literary activity manifested itself as early as the 4th century in the translation of almost the whole of the Bible (probably by Bishop Ulfilas), fragments of which remain, and are cherished by the Germans as the earliest monument of their ecclesiastical literature, although it was composed in the Gothic language. The British missionaries established cloisters and brotherhoods in Germany between the 6th and 8th centuries, and laid the foundation for that system of instruction which in the 8th century was perfected by Charlemagne. Metrical translations of the Gospels appeared in the 9th century in the old High and Low German dialects, the former (*Krist*, new ed., Berlin, 1831) in rhymes,

and the latter (*Heliand*, first published in Munich, 1830-'40) preserving the ancient alliterations. A translation of the Psalms by Notker, which dates from about the same period, is regarded as one of the best specimens of old High German literature. The *Ludwigslied*, a psalm in honor of the victory of the Frankish king Louis III. over the Normans about 880, which Herder extols as one of the best specimens of early German poetry, was composed in the old High German dialect by a Frankish churchman. The preservation of the song of Hildebrand, which is associated with the legends of Theodorico and Attila, is also due to churchmen, who transmitted it partly in the old High German and partly in the Low German dialect. Several Latin poems were also based upon Hunnish and Burgundian legends, but with these exceptions the priesthood were generally opposed to the national poetry on account of its pagan associations. Many Latin chroniclers and poets flourished in this and the following period; there was also a Latin poetess, Roswitha, or Helena von Rossow, who wrote Latin religious plays. The learning which flourished under the Saxon emperors was superior to that of the times of Charlemagne. The study of mathematics was next in importance to that of theology and Latin. The Greek language, although it was but little cultivated, was not unknown. From the 10th to the 13th century Germany probably possessed a higher mental cultivation than any other country in Europe, but on the whole it was of a Latin and ecclesiastical cast, and the people had no share in it. In the 12th century appeared a hymn in praise of Hanno, archbishop of Cologne, which Herder calls a truly Pindaric song. Among the last poems which appeared in this era from the pen of churchmen were the *Rolandlied* and the *Alexanderlied*.—In the 12th century poetry passed from the monasteries and ecclesiastical schools to the palaces of princes and the castles of nobles. Most of the poets who then came forward were nobles by birth, some of them princes. Heinrich von Veldeke was the first to introduce into his heroic poem *Enoit*, which he is said to have composed after a French version of Virgil, the spirit of devotion to woman, or *Minne* (an old German word for love, whence the name *Minnesänger*). Veldeke is regarded as the originator of the heroic minstrel song, although he is far surpassed in genius, elevation of thought, and depth of feeling by Wolfram von Eschenbach. The other masters of the heroic muse were Gottfried of Strasbourg, Hartmann von der Aue, and Konrad of Würzburg. Their longer heroic poems treat chiefly of the exploits of Charlemagne and of the story of Arthur and the round table. At the same time they composed many songs. Love was their principal theme, but from a sense of delicacy the name of the lady who was the special object of adoration was never mentioned. Respect for womanhood, which was reckoned among the virtues of the ancient

Germans even in the days of the deepest barbarism, contributed to make the German love songs more reverential than those of the French troubadours. A species peculiar to the bards was called the watch song, consisting in a dialogue between a lover and the sentinel who guards his mistress. Walther von der Vogelweide was the most gifted of these lyric poets. Next to him rank Heinrich von Ofterdingen, Reimar der Alte, Heinrich von Morungen, Gottfried von Neifen, and the Austrian bards Nithard and Tanhäuser. Several hundred of these poets were engaged in wandering from palace to palace and from castle to castle. The minstrels constituted what is called the Swabian school of poetry; the songs were mostly in the Swabian dialect. The accession of the Swabian emperors of the house of Hohenstaufen to the throne of Germany was the signal for the rise of the bardic art (1138). Its golden age was shortly before the fall of that dynasty (1254). The crowning event of the minstrel era was the appearance of the lay of the *Nibelungen*. It was followed by the "Book of Heroes" (*Heldenbuch*), consisting of a collection of fragmentary pieces treating of the same legends as the *Nibelungen*, but mixed up with traditions of the crusades.—Didactic poetry began to be cultivated with some success in the 13th century. The dawn of historical works is heralded by several local chronicles; that of writings on natural history in the so-called *Meinauer Naturlehre*; of popular religious literature in the sermons of David of Augsburg and Berthold of Winterthur; and of works on jurisprudence in compilations of Saxon and Swabian laws (*Sachsenspiegel* and *Schwabenspiegel*). Ulrich von Lichtenstein deplores, in 1275, in his famous poem on *Frauentruet* (devotion to woman), the decline of chivalry, but his attempt to revive its spirit was hopeless. Poetry now passed from the abodes of princes and knights to the homes of burghers and the workshops of artisans; and instead of *Minnesänger* we hear of *Meistersänger*, as the plebeian songsters were called. The 13th century, the greater part of which was so rich in poetical productions, was one of the most unfruitful for the cause of learning. Leibnitz says that the 10th century in Germany was a golden age in that respect compared with the 18th.—In the 14th century Germany possessed several mystic theologians, followers of Meister Eckart, the principal of whom was Johann Tauler (1290–1361), whose sermons and writings contributed to pave the way for the reformation. An important event of this century, in its general influence upon the future development of German literature, was the establishment of the university of Prague in 1348, soon followed by universities in almost all parts of Germany. The last echoes of the period of chivalric poetry were two allegorical romances, *Teuerdank* in verse, and *Weisskünig* in prose (first published at the beginning of the 16th century), of which the emperor Maxi-

milian is the hero and probably the author, although Melchior Pfünzing is said to have composed the former romance at the emperor's request. The only good poetry of the 14th and 15th centuries was the spirited songs of Halbauter and Veit Weber, celebrating the victories of Switzerland over Austria and Burgundy.—The progress of classical culture was stimulated at the opening of the 15th century by the establishment of learned societies and schools in different parts of Germany and the Low Countries. Hegius, Langius, Dringeburg, Reuchlin, Agricola, and other eminent men were among the scholars. Purbach was the first restorer of mathematical science, and his pupil Regiomontanus (Johann Müller) was the greatest mathematician of the 15th century; while Gutenberg was one of its heroes. His invention of the art of printing produced a steadily increasing literary activity, and the books printed in Germany between 1470 and 1500 amounted to several thousand editions.—The 16th century opened with the foundation of the university of Wittenberg (1502), and inaugurated along with the reformation a new era in literature by Luther's translation of the Bible, which he rendered into German so harmonious and beautiful that it is considered even at the present day as a model of terse expression. The High German, as used by Luther, is so pure that all the antiquated and anomalous dialects which had until then alternately predominated in German composition were from that time more or less banished from the language, and the idiom of the Bible has since become the sole medium of cultivated conversation and of German literature. Hymns and psalms were now brought to perfection. That famous religious lyric, *Ein' feste Burg ist unser Gott*, and others of Luther's finest hymns, have become classic, and have found hosts of imitators, the most distinguished of whom were Decius and Speratus, and, in the 17th century, Paul Gerhard. Michael Weiss translated the hymns of Huss into German. The writings of Luther, Zwingli, Johann Arnd, Melancthon, Ulrich von Hutten, Bugenhagen, Bullinger, and other reformers and scholars, constitute the principal theological literature immediately connected with the reformation. In historical works, the influence of the reformation manifested itself in the superior style and greater comprehensiveness of the universal histories of Sebastian Frank and Sebastian Münster; also in chronicles of Switzerland by Tschudi, and of Bavaria by Aventinus. Frank also published a collection of German proverbs; in which branch of literature, however, he was preceded and excelled by Johann Agricola's *Auslegung deutscher Sprüchwörter*. Albrecht Dürer's writings unfolded original views of the fine arts in their connection with mathematical science. The principal events in prose belles-lettres were the translations into German of Latin tales, in which Boccaccio, Poggio, and other Italian novelists and

poets were for the first time introduced to German readers. Translations of Tasso and Ariosto also appeared. Many of the ancient chivalric stories, which had been published in prose in the 15th century, were republished in the 16th; collections of them were made and called *Volksbücher* (books for the people), of which the *Buch der Liebe* ("Book of Love") became the most popular. The period before and after the reformation was especially fruitful in satirical and allegorical works. One of the most remarkable of the former kind was the *Narrenschiff* ("Ship of Fools"), by Sebastian Brant of Strasburg (new ed. by Zarncke, Strasburg, 1864), a metrical satire on the follies of the century, which in the opinion of Hallam may possibly have suggested to Erasmus his *Encomium Morie*. Thomas Murner imitated this in his *Narrenbeschwörung* ("Conjurament of Fools"), and published one of his bitterest satires on Luther under the title *Von dem grossen Lutherischen Narren* ("Of the Great Lutheran Fool"). The fable of *Reineke Fuchs* (afterward immortalized by Goethe's poem), the origin of which is identified by many authorities with the ancient epic or didactic poem of the *Thiersage*, and which in different periods had appeared in a variety of forms, was revived in a Low German edition (translated from the Dutch) in the latter part of the 15th century, and was looked upon in the 16th as a satire on the government and state of society of Germany. It was followed by a great number of poems of the same kind, of which one whose characters are fleas is the most witty. Among the purely didactic fabulists were Alberus and Burkard Waldia, both also eminent as composers of hymns. Among the more comic of the *Volksbücher* was the story of *Till Eulenspiegel*, relating the freaks, pranks, drolleries, fortunes, and misfortunes of a wandering jester (new ed. by Lappenberg, 1854). The ablest satirical and didactic poet of the 16th century was Johann Fischart, the author of more than 50 works, including the above mentioned fable on fleas (*Flohate*), and of a romantic poem (*Das glückhafte Schiff*) which was regarded as a model for romancers. He has been called the German Rabelais. The story of Faust and the autobiography of Götz von Berlichingen, afterward adorned by Goethe, were also among the popular works of this century. The *Volkslieder* or popular songs of this period were much admired by Herder, who was the first to collect them. The *Meistersänger*, upon whom the mantle of the minstrels had fallen since the 14th century, had established metrical schools in various German towns, in the same spirit in which they would have founded guilds of trade. Their highest ideal of poetry was conformity to the rules of versification which were adopted by their school committees. In the 16th century their corporation derived great prestige from the genius of Hans Sachs, the poet and cobbler of Nuremberg (then the headquarters of the

Meistersänger), whom Herder calls the *Meister of Meistersänger*, and who excelled more than any poet before him in all styles of composition, from the most tragical touch of feeling to the most comic turn of thought. His song dedicated to Luther (*Wittenbergische Nachtigall*) was especially fine. Frauenlob and Michael Behaim were also poets, and Rosenblüt and Folz playwrights of some note, the former of whom was also one of the best tale writers of his time. Among the contributors to the drama who succeeded Hans Sachs, he was excelled in skilful arrangement of plots by Jakob Ayer (died in 1606), and in grace and refinement of composition by Andreas Gryphius (1616-164).—During the excitement occasioned by the reformation almost all branches of composition were cultivated, but in learned and scientific literature the 16th century was most prolific. Besides Melancthon, whose influence secured the preponderance of the Aristotelian philosophy in the Protestant schools of Germany for more than a century, were Luther, Camerarius (classics and philology), Cornelius Agrippa, Theophrastus Paracelsus (mystical philosophy and natural history), Copernicus (astronomy), Leonhard Fuchs (botany and medicine), Conrad Gesner (botany, zoology, and classics), and Agricola (mineralogy). At the expiration of the 16th century few of the great scholars of Germany were left, and classical culture was declining in the early part of the 17th. The numerous universities and schools which had sprung up under the influence of the reformation were no longer animated by the zeal of the reformers, but engrossed by subtle polemical and scholastic strifes. The deliverance of the German intellect from the scholastic bonds of the middle ages, which was the cherished endeavor of Luther, was again retarded.—Poetry, in passing from the *Meistersänger* to scholars, lost in naturalness what it gained in elaboration. Most aspirants to poetical fame in the 17th century were graduates of universities, and learned societies were formed at its beginning, with a view of improving the German language and literature. These societies became as notorious for their imitations of the Italian academies as the corporations of the *Meistersänger* had been for attempting to mimic the minstrels. After their dissolution they were replaced by many literary and scientific associations in Leipzig, Berlin, Hamburg, Königsberg, Halle, and in others of those principal central and university towns of Protestant Germany which had become the leaders of German culture. A new school of poetry was established, of which the forerunners were Friedrich von Spee (died in 1635) and Georg Rudolf Weckherlin (1584-1651), the first author of sonnets in German. Martin Opitz (1597-1639) became the leader of this school, which after his native country was called the first Silesian school. He wrote the language with a purity of idiom in which he rivalled Luther.

He imparted more vigor to the versification, and wrote many lyrical, mixed, and didactic poems. Although more scholastic than poetical, he exerted a great influence on literature, at a time when the thirty years' war and the growing taste for bad Italian and French modes of composition threatened to annihilate all vestiges of pure German poetry, and when the reforms introduced by Luther into the language still required to be steadily urged and followed up in order to become established. Paul Flemming (1609-140) was the principal lyrical, and Simon Dach (1605-159) a gifted sentimental poet of this school. Von Zesen (1619-189) was the greatest purist of them all, strenuously opposing the admixture of French words, which was becoming more and more common in Germany. Halsdörfer was one of the principal poets of the pastoral Nuremberg branch of the school. Among the other eminent poets were Christian Weise, who excelled in popular songs and the drama, and afterward opposed the Silesian schools, and Friedrich von Logau (1604-55), a witty epigrammatist. Andreas Gryphius did much to improve the German drama, and his poetry was as excessively passionate as that of Opitz was conventional and cold. This conventionality gave rise to a formidable opposition, at the head of which stood Hofmannswaldau (1618-179) and Lohenstein (1635-88), who took the most inflated Italian and French writers as their models, and became proverbial for bombast and artificiality. They in their turn were opposed by Canitz, the Berlin statesman and poet (1654-190), Besser (1654-1729), and König (1688-1744), most of whom were court poets, who endeavored to imitate the then fashionable verses of Boileau, but were unable to resist the success of Lohenstein's affected and extravagant effusions. Imitativeness was the bane of literature in Germany; only a few, as Brockes of Hamburg (1680-1747) and Günther (1695-1723), were free from it, while Neukirch (1665-1729), and especially Wernike of Hamburg (died about 1720), were almost the only poets who dared to protest against it.—The most successful authors of novels in this period were Buchholz, Von Zesen, Ziegler, Klipphausen, Lohenstein, and Duke Anton Ulrich of Brunswick. The most entertaining book of the century was a collection of tales of adventure (*Simplicissimus*) by Grimmshausen, a style of composition in which he had been preceded by the satirist Moscherosch. The writings of the Roman Catholic preacher Abraham a Sancta Clara (1642-1709) are distinguished by a broad humor, especially his *Judas*. Among the prose writers of the 17th century were S. von Pufendorf in political philosophy, Kepler (who wrote in Latin) in astronomy, and Gottfried Arnold in ecclesiastical history. Among writers on theology and ethics, Spener, the founder of Protestant pietism, takes a prominent position. In philosophy and learning Latin continued to be the sole medium of literature; and Jakob

Boehm (1575-1624), the great mystic, stood for a long time almost alone in the use of the vernacular tongue, until the latter part of the century, when Leibnitz (1646-1716) and Wolf (1679-1754) appeared. Christian Thomasius (1655-1728), the able jurist and pietistic philosopher and writer, was the first, in his lectures at Leipsic and afterward at Halle, to substitute the German for the Latin language as the medium of instruction. He was also among the very first to use the German language in his writings, and established the first German learned periodical in Leipsic (1688-'90). Leibnitz was the first to lay a scientific basis for the study of philosophy in Germany, but his works were chiefly written in Latin and French. Wolf, his disciple, shaped the views of Leibnitz into a comprehensive system, and published his works in the German language.—Under the impulse of the new philosophical ideas, Germany became in the 18th century excited on the subject of literature, as it had been on that of theology in the 16th. The 17th closed with the foundation of the Berlin academy by Leibnitz (1700). The general clamor was for reform in education, in literature, and soon for reform in all departments of thought. Gottsched in Leipsic (1700-1766), laboring in the same direction as Thomasius, exerted himself to make the German language the sole medium of instruction, and published in it manuals and abridgments of philosophy and science. He advocated the classical rules of composition of Racine and Corneille, but aimed above all at correctness. His views brought him into conflict with Bodmer (1698-1783) and Breitinger of Zürich (1701-'76), who were admirers of Milton and rigidly orthodox in religion, while Gottsched was friendly to Voltaire. They carried on a paper war in their respective journals, until at length many who had rallied round Gottsched became disgusted with his pedantry, and separating themselves from him, established a periodical celebrated in German literature under the name of *Bremer Beiträge*, edited by Gärtner (1712-'91), in which they opposed their former friend; at the same time they formed a poetical union to which Hagedorn was friendly, although he did not join it, but which was eventually joined by Klopstock, who became its hero. Among the contributors to this journal were Rabener (1714-'71), a popular satirist, of a correct and easy style; Zacharia (1726-'77), a writer of poetry in imitation of Pope's "Rape of the Lock;" Gellert (1715-'69), a famous fabulist; Kästner, the poet and mathematician; Giseke; Johann Elias Schlegel, dramatist, and Johann Adolph Schlegel (1721-'98), poet; Fuchs, Cramer, Ebert, translator of Young's "Night Thoughts," and several others. The journal was printed in Bremen, but the poets resided for some time at Leipsic, whence they adopted the name of the second Saxon school, while the followers of Bodmer (of Zürich) styled themselves the Swiss school.

Related to the latter was the school of Halle, to which belonged Lange, Pyra, Uz, and Götz. The most distinguished of the poets of this school were Kleist (1715-'59), author of descriptive and picturesque poetry in the manner of Thomson and Pope, and Ramler (1725-'98), a composer of odes, and the first to introduce the language, versification, and manners of the ancients into Germany. Gleim (1719-1808), the celebrated fabulist and poet, at first a follower of Bodmer, gathered a knot of writers around him, and exercised for about 40 years a considerable influence on German poetry; but his fame was diminished by the criticisms of Herder. Salomon Gessner of Zürich (1780-'87) gained in his time a high reputation as a writer of idyls, but Herder thinks that he was overrated by his contemporaries. Bodmer's prestige was also soon broken by the criticisms of Lessing. Of greater influence than any of the poets as yet named were Hagedorn of Hamburg (1708-'54), whose fables and songs have immortalized him in Germany, and Albert von Haller (1708-'77), the illustrious physiologist and savant, who was remarkable as a writer of descriptive and didactic poetry. They were followed by Klopstock (1724-1803), whose "Messiah" made a profound impression upon the religious world by its mystic, devout, and rapturous faith, while as a work of art it was greatly admired. The fashionable and elegant portion of society was attracted by the semi-Grecian, semi-Parisian muse of Wieland (1733-1813). But it was reserved for Lessing (1729-'81) to give a new direction to German literature. He did for it what Luther had done for the German language. He established a new school of criticism, and struck a final blow at Gallic influence, at the same time that Frederick the Great was coquetting with the French graces. His tragedy *Emilia Galotti*, his comedy *Minna von Barnhelm*, and his philosophical drama *Nathan der Weise*, are models of dramatic composition. He exerted a powerful influence on the progress of the German drama by unfolding for the first time all the beauty, vigor, and originality of Shakespeare before the German mind, and by the profound and philosophical criticisms in his *Dramaturgie*. He pronounced a condemnatory judgment upon all foreign models except Shakespeare and the ancients, and demonstrated that the spirit of the age shrank from the mediæval sentimentality of epic poetry, and desired literature to reflect its own stirring energies, as the drama alone can do. Most celebrated among the many literary publications which were identified with Lessing's critical labors was a periodical (*Literaturbriefe*) which he founded in Berlin in 1759, in conjunction with Nicolai (1733-1811), the publisher and author. Lessing was the master spirit of this publication, and the principal contributor next to himself was his friend Moses Mendelssohn (1729-'86). Both Klopstock and Wieland were criticised in that peri-

odical, and it was the first to discover the merit of Winckelmann the archæologist, of Hamann the mystic philosopher, and the philosophical genius of Kant, although at that time he had only written some short treatises. Shortly after the commencement of the *Literaturbriefe*, a new influence was infused into the literary world by Herder (1744-1803), who while at Königsberg became acquainted with Hamann and Kant, and who was known as a scholar as early as 1762. He brought to bear upon literature an almost universal knowledge, the study of the poets of all nations, an intimate acquaintance with Hebrew, Greek, and Latin writings, and above all a cosmopolitan humanitarian spirit, which, together with his poetical genius, manifested itself most suggestively in the crowning work of his life, *Ideen zur Philosophie der Geschichte der Menschheit*. He contributed powerfully to promote the study of oriental poetry, and was the first to call attention to the beauty of the ancient popular songs of different nations, and particularly of his own. Another great impulse was given by Winckelmann (1717-'68). His examinations of the remains of ancient art and his writings modified all the old theories of the beautiful; and by his efforts, combined with those of Lessing, whose celebrated work *Laokoon* was elicited by Winckelmann's suggestions, the spirit of art and poetry was brought back to the genuine and simple taste of the Greeks. Heyne, the accomplished critic and commentator, propounded the theories of Winckelmann at Göttingen, then the most brilliant university of Germany. The young men there became deeply impressed with the new theories, and, under the influence of the reforms which were then initiated in religion, philosophy, literature, art, and education—in almost all departments of thought and life—founded in 1770 the *Musenalmannach*, a literary journal, and not long afterward a poetical union known as the *Göttinger Dichterbund*, or *Hainbund*. Klopstock became the leader and model of these enthusiastic youths, whose aim was to give a new stimulus to poetic emulation, and to oppose to conventional theories a school of poetry founded upon the inspirations of genius and humanity. Among the members of the union were Bürger (1748-'94), the author of *Lenore* and other wild and picturesque ballads and songs; Voss (1751-1826), one of the most learned and eloquent philologists of his day, immortalized by his translations of Homer and Virgil, and the author of one of the best German idylls (*Luise*); Höltz (1748-1776), whose songs became exceedingly popular; the two Stolbergs, who coöperated with Voss in familiarizing the Germans with the ancients, and who excelled in various kinds of metrical composition; Claudius, Miller, Hahn, Cramer, Gotter, and Boje. A genial poet of this period was Pfeffel (1786-1809), whom it would be difficult to class with any particular school. Goethe (1749-1832), already known to fame, and ac-

quainted with Herder and other poets, but keeping himself aloof from all unions and parties, came forward in 1773 with *Götz von Berlichingen*, which was greeted as the commencement of an entirely new period in German dramatic literature. In 1774 appeared *Werther's Leiden*. The reformatory period of literature was now over. The revolution had set in, or the *Sturm- und Drangperiode*, as it was called after a drama of that name by Klinger (1753-1831), whose high-wrought tragedies and novels, as well as the writings of Schubart (1739-'91), Heinse (died in 1803), Lenz (1750-'92), and Müller (1750-1825), reflect most forcibly the excitement of this epoch. In the mean time Schiller (1759-1805) produced his *Räuber*, followed by *Fiesco* and *Cabale und Liebe*. These impassioned tragedies gave a new impetus to the literary excitement. His *Don Carlos*, however (1784), shows greater moderation, and opens a long series of tragedies in which the highest aspirations for liberty and humanity are interwoven with historical associations, expressed in language of the most classical purity. But it was only after Schiller's union with Goethe (1795) that by their combined labors German literature was brought to that classical perfection which, from a purely national, has since given to it a universal influence. Schiller, by his enthusiastic and sympathetic eloquence and tenderness, became the favorite of the people; and Goethe, with his many-sided intellect and boundless sensibilities, controlled by a strong will, encased in a body of exuberant health, and disciplined by an all-embracing culture and knowledge, became the acknowledged sovereign of German literature.—While this golden era of letters was in a great measure accelerated by the philosophic spirit of the age which had prompted the labors of Lessing and the other reformers, that spirit itself gathered strength from the light which it diffused, and in rapid succession gave birth to Kant (1724-1804), Fichte (1762-1814), Hegel (1770-1831), and Schelling (1775-1854). Lessing, especially by his comprehensive essay on the "Education of the Human Race," Herder, Moses Mendelssohn, and Hamann are philosophical writers of great eminence. In a popular style wrote Engel, the author of *Lorenz Stark*, and the psychological novels of Jacobi are among the most suggestive of German prose writings. Among other prose writers are Reinhold and Barth; Alexander Gottlieb Baumgarten, generally considered the founder of the science of æsthetics (in Latin); Meier, the German interpreter of his theories; and Sulzer, who wrote on the same science. Abbt, Garve, Liscow, the philosopher and elegant fabulist, Lavater the physiognomist, his friend Zimmermann, and his sarcastic and polished opponent Lichtenberg; the historians Dohm, Möser, Schröckh, Schlözer, and Beck; Spittler, the celebrated Göttingen historian; Mosheim, the ecclesiastical historian; Johannes von Müller, the his-

torian of Switzerland, one of the classical historiographers of Germany (1752-1809); Georg Forster, the teacher and friend of Alexander von Humboldt, an admirable writer; the publicist Friedrich Karl von Moser; the educator Basedow, and afterward Pestalozzi; Campe, the writer of books for children; Nicolai, the friend of Lessing and author of the satirical novel *Sebalduß Nothanker*; Adelung, the philologist; Böttiger, the antiquary; Sturz, the biographer; Reimar, Jerusalem, Spalding, Michaelis, Rosenmüller, and Ernesti, in theology; Eichhorn in theology and universal and literary history; Blumenbach, Bloch, Herschel, Euler, Vega, and many other eminent writers in various branches of learning and science, belong to this period.—A peculiar and powerful writer, who stood quite alone in his idiosyncrasies, was Jean Paul Friedrich Richter (1763-1825). He puzzles the reader by his inability to assort his thoughts, which he pours out with the reckless *natveté* of a childlike soul; but the obscurity is lighted up by flashes of humor and brilliant gems of thought and feeling. The influence of this genial philosopher was great, especially upon the women of Germany. Novalis (Von Hardenberg, 1772-1801) was another strangely constituted writer, who uttered himself in poetic sighs rather than in vigorous words; but amid his morbid sentiments are scattered thoughts of such wisdom and spiritual insight that his poems and prose writings, although few and fragmentary, gave him a place among the classical authors of his country. He is regarded as the head of the so-called romantic school, which draws its inspiration from the fabulous, mediæval and chivalric eras of literature and history. Among the most brilliant masters of this school was August Wilhelm von Schlegel (1767-1845), the author of an antique tragedy, *Ion*, and of romances and elegies, but chiefly distinguished for his admirable metrical translation of Shakespeare, his critical and æsthetic writings, his lectures on the drama and its literature, and his labors connected with Indian literature and the Sanskrit language. His brother Friedrich von Schlegel (1772-1829) was also engaged in the study of Hindoo literature; but his specialty was the history of ancient and modern literature and the philosophy of history. The most original representative of this school was Ludwig Tieck (1773-1853), whose poetical dramatization and collection of ancient fairy and popular tales reflect the romance of mediæval poesy with beauty and genius, but with a mystic feeling bordering almost on superstition. The writings of Tieck's friend Wackenroder (1772-'98) were the first to enlist the sympathies of the German artists for the æsthetic principles of the romantic school. La Motte Fouqué (1777-1843), of the same school, stands alone in German literature by his remarkable delineations of fairy lore, as for instance in his tale of *Undine*. Chamisso (1781-1888), the author of *Peter Schlemihl* and of many fine lyrics, Tiedge

(1752-1841), the author of the philosophical poem *Urania*, the Aristophanic Platen (1796-1885), and the mystic religious poems of Werner, all belong to this romantic school; and with but few exceptions, as for instance the patriotic and spirited poet Senne (1763-1810), most writings of this period are tinged with a morbid passion for romantic and sentimental views of life. This epoch comprises the lyrical poets Schenkendorf (1783-1817), Stägemann (1763-1840), Kosegarten (1758-1818), Baggesen the Dane (1764-1826), Matthisson (1761-1831), Mahlmann (1771-1826), Salis (1762-1834), and Eichendorff (1788-1857), several of whom belong to the romantic school. Among novelists and tale writers are Achim von Arnim (1784-1831) and Clemens Brentano (1777-1842), the compilers of a series of celebrated popular songs (*Des Knaben Wunderhorn*), and Ernst Theodor Amadeus Hoffmann (1776-1822), the author of many wild, fantastic tales and legends (*Elisir des Teufels*, *Kater Murr*, &c.), which cap the climax of the supernaturalistic element of the romantic school. Among favorite novelists of this period are J. T. Hermes (1788-1821); Hippel (1741-'96), the indiscreet friend and disciple of Kant; Musäus (1785-'87), the author of a collection of *Volkmärchen* or popular fairy tales; Lafontaine (1759-1831), a type of the most sentimental novelists; Blumauer, J. G. Müller, and Thümmel (1788-1817), the author of a novel in imitation of Sterne's "Sentimental Journey;" Jung-Stilling (1740-1817), the inspired tailor in whose naïve and original autobiography Goethe, Schiller, and Herder took so much interest; Knigge (1752-'96), the author of the *Reise nach Braunschweig*; and Immermann (1796-1840), the author of the famous story of *Münchhausen*. Ghost stories were for a time made popular by Schiller's *Geisterseher*, and to this department of literature Jung-Stilling also contributed. Associated with the romantic school, in the earlier part of her literary career, was Bettina von Arnim (1785-1859), celebrated by her correspondence with Goethe. Rahel, the wife of Varnhagen von Ense (1771-1833), was a literary woman of much greater talent and originality of thought. Among other distinguished authoresses are Auguste von Paalzow, Ida von Hahn-Hahn, Amalie Schoppe, Johanna Schopenhauer, Friederike Brun, and many others. Talvj (Mrs. Robinson) contributed to diffuse a knowledge of Servian popular songs and of Slavic literature generally, and won great distinction in this and other spheres of literature.—The efforts of Klopstock, Herder, and other authors to revive the popularity of the early German poetry, as well as the sentiment of nationality which was roused at the beginning of this century by the aggressive policy of Napoleon I., contributed to give a powerful impulse to the researches into the ancient German literature, which was to some extent fostered by Jahn's spirited work on *Deutsches Volkthum*. Von der Hagen, by his

edition of the *Nibelungen*, did much to promote a love for the study of the old German dialects and the poetry connected with them. The brothers Wilhelm and Jakob Grimm are the more immediate founders of this new branch of philological and poetical investigation. Benecke, Lachmann, and Simrock labored in the same direction, and more recently Moritz Haupt; also Franz Pfeiffer, Oskar Schade, Zarneke, Holtzmann, Hoffmann von Fallersleben, Bartsch, &c.—The German war of independence against Napoleon I. produced some striking patriotic songs from Prof. Arndt of Bonn (1769–1860), and Theodor Körner (1791–1813), the gallant soldier-poet, and author of *Leier und Schwert* ("Lyre and Sword"). Some of the lyrical poets of the romantic school whom we have named also became distinguished for their patriotic effusions, especially Schenkendorf and Stagemann. Wilhelm Müller of Dessau (1794–1827), author of the admirable *Griechenlieder*, may be classed among patriotic poets. The maiden efforts of Friedrich Rückert (1789–1866), one of the best lyrical and didactic poets of Germany, and celebrated as much for his imitations of troubadour songs as for his versions of oriental poetry, were also inspired by the war against the French. Another who came forward as a champion of national independence was Uhland (1787–1862), the chieftain of the modern Swabian school, and one of the leading poets of Germany. Stuttgart, the seat of the great publishing house of Cotta and of the critic Wolfgang Menzel, was the headquarters of this school. Hebel (1760–1826), whose *Alemannische Gedichte* were greatly admired by Goethe, belonged to it by the Swabian dialect and spirit of his songs, although he lived at an earlier period. An eminent lyrical poet of this school was Justinus Kerner. Gustav Schwab, Pfizer, the critic and historian, Karl Mayer, and Mörike, all belong more or less to the Swabian school. A new direction was given to literary activity by the political excitement immediately preceding and succeeding the French revolution of 1830. Ludwig Börne (1786–1837) and Heinrich Heine (1800–1856) are regarded as its heralds, the former by his pungent and comprehensive political satires, the latter by his keen insight and peculiar lyrical genius. Heine exercised a wide influence in the literary world. As a poet, he had a peculiar gift of uniting the tragic and comic in a felicitous and racy manner, which made him the idol of a new school of authors who styled themselves "Young Germany," but who partook much less of Heine's poetical gifts than of his political sympathies. Karl Gutzkow (born in 1811) was the head of this school. He is the author of *Die Ritter vom Geiste* and *Zauberer von Rom*, and of many other novels, and several dramas. The other principal representatives of "Young Germany" are Heinrich Laube (born in 1806), Gustav Kühne (1806), and Theodor Mundt (1808). An emi-

nent author of this period is Baron Sternberg (1806), author of *Diane* and *Paul*, and of many other works which hold up the mirror to the social and political condition of his country. Another famous writer and amateur liberal politician of this class is Prince Pückler-Muskau (1785–1871), author of *Briefe eines Verstorbenen*, and of other piquant books. The taste for novels of a political and social tendency has been characteristic of German writers since the early part of this century. The novels of Gutzkow, Laube, and many other contemporary German writers, all belong to this category, while Gustav Freytag has gained a high reputation by several excellent novels, among which the best known is *Soll und Haben* ("Debit and Credit"). The line of historical novelists was opened by Meissner (1753–1807); he was followed by Karoline von Pichler (1769–1843), Tromlitz (Von Witzleben, 1773–1839), Van der Velde (1779–1824), Karl Spindler (1796–1855), author of *Der Jude*, *Der Bastard*, and other novels, which enjoyed great popularity; Rellstab, Storch, Rau, and Koenig (1790–1869), author of *Die Clubisten in Mainz* (1847). Berneck or Bernd von Guseck (born in 1803), Mügge (1806–'61), author of *Toussaint* and other excellent novels, Kühne and Heller (1813–'71), are all contributors to this class of novels. Here belong also the semi-historical novels of Louise Mühlbach (Mme. Mundt, 1814–'73), which have enjoyed a very wide popularity, but are not entitled to high rank either from a literary point of view or as interpreters of history. A far higher merit must be awarded to Zschokke (1771–1848), one of the best German prose writers of recent times, author of many excellent historical and romantic works, and of *Stunden der Andacht*, a religious work, which has passed through many editions. Heinrich Steffens, the Norwegian philosopher and naturalist (1773–1845), wrote German novels based upon Scandinavian history, which are replete with interest. Another historical novelist is Wilhelm Häring, known by the pseudonyme of Wilibald Alexis (1797–1871), who imitated so skillfully the manner and style of Sir Walter Scott that several of his works were translated into foreign languages and passed for some time as the productions of the great English romancer. The most famous of the kind is "Walladmor." Hauff, a genial novelist, whose *Lichtenstein* takes high rank among historical romances; Olaurén, a licentious writer, but one whose novels have been read extensively; and Hackländer, the author of *Soldatenleben*, *Handel und Wandel*, and many other works, and the founder and conductor of the widely known journal *Ueber Land und Meer*, may be mentioned here; also Berthold Auerbach (1812), who attracted immediate attention by his first work, *Schwarzwälder Dorfgeschichten*, and has since taken his place among the leaders of German fiction, his novel *Auf der Höhe* having gained a very wide reputation in Germany,

England, and America, which has been increased by his later works. Among German novelists of the last decade whose works possess permanent value, the leading place is undoubtedly occupied by Friedrich Spielhagen, whose *Problematische Naturen*, *Durch Nacht zum Licht*, *Hammer und Amboss*, and other works, enjoy a great popularity and high esteem. Heinrich Laube, Alfred Meissner (a grandson of the historical novelist), Max Ring, Edmund Hoefer, Fanny Lewald, Levin Schücking, Karl von Holtei, and others, have been prolific contributors to the recent literature of fiction. Eugenie John, best known under the *nom de plume* of E. Marlitt, has written several excellent novels, among which *Goldeloe* (1866), *Das Geheimniß der alten Mamsell* (1867), and *Reichgräfin Gisela* (1869) have been exceptionally popular, and have been translated into English. Paul Heyse is another contemporary novelist whose works have attained and deserved much success.—Among the poets who have expressed liberal political tendencies with most point are Hoffmann von Fallersleben, the author of *Unpolitische Lieder*; Herwegh, author of *Gedichte eines Lebendigen*; Dingelstedt, author of *Lieder eines kosmopolitischen Nachwächters*; Prutz (born in 1810), Kinkel (1815), and Freiligrath. Among other recent poets who have acquired some eminence are Grabbe, Gottschall, Emanuel Geibel, Redwitz, Paul Heyse, Wolfgang Müller, Max Waldau, Gerokt, Bodenstedt (especially distinguished for his versions of Persian poetry), Böttger, Simrock, Kugler, Keller, Schefer, and Hammer, many of whom excel in ballads and songs after the style of the Swabian school. A circle of poets in Vienna cluster round Anastasius Grün (Count Auersperg), the greatest lyric poet of Austria, author of *Spaziergänge eines Wiener Poeten*, *Schutt*, *Der letzte Ritter*, &c. Lenau and Karl Beck were the principal and most gifted of his followers. Alfred Meissner and Moritz Hartmann belong to this school. A few other names of writers who have acquired a passing reputation by attractive or melodious verses might be added here; but during the past decade no really great poet, whose fame is likely to be lasting, has appeared in Germany. The war against France in 1870 called forth, it is true, many national and martial lyrics, among the best of which were several by Freiligrath and Geibel, as well as some stirring songs by the newer writers Gottschall, Grosse, Rittershaus, and Jensen. Several of those named in the list of recent poets given above also produced noteworthy war lyrics. *Die Wacht am Rhein*, written long before (about 1840) by Schneck-enburger, became the popular war song of the armies of 1870; but its literary worth was small compared with many others of the national poems published during the period of its popularity.—Dramatic literature has also fallen from the high estate which it had reached through Lessing, Goethe, and Schiller. Gerstenberg (1787–1828) was the author of the

high-wrought tragedy *Ugolino*, noticeable only for its extravagance. Among his contemporaries were some excellent dramatists and poets, as Cronegk, Leisewitz, Weisse, &c. Iffland (1759–1814), in a long series of plays, reflected the life of respectable people of the middle classes; they are eminently moral in their tone, but long and heavy. Werner (1768–1828) became the founder of the so-called tragedy of fate (*Schicksalstragödie*) by his piece called *Der Vierundzwanzigte Februar*. The imitators of his extravagant style are Müllner (1774–1829) in his *Schuld*, Howald (1778–1845) in his *Bild*, and Grillparzer (1790–1872) in his *Ahnfrau*. Kotzebue (1761–1819) succeeded in obtaining a higher popularity than all his contemporary playwrights. His forte was in comedy. He wrote more than 200 plays, some of which have been adapted to the English and French stage. Münch-Bellinghausen (*nom de plume*, Friedrich Halm) has written an excellent drama, *Der Sohn der Wildnis*, a national tragedy, *Der Fechter von Ravenna*, and other works. Maltitz, Eichendorff, Julius Mosen, Gutzkow, Laube, Hebbel, Griepenkerl, Prutz, and Brachvogel have all cultivated dramatic literature. Charlotte Birch-Pfeifer (1800–'68) dramatized a great number of stories. Karl Immermann belongs to a higher class of dramatists; his trilogy *Alexis*, and his mythical play *Merlin*, and many of his tragedies and comedies, are excellent reading plays, but they are not well suited to the stage. M. Beer's *Struensee* is also a work of high poetical merit. Raupach (1784–1852) was one of the most fertile of German dramatists. Eduard Duller (1809–'58) wrote several historical dramas. The comedies of Hackländer, and particularly of Benedix, display considerable ability; and among other writers of comedy are Feldmann, Töpfer, Albini, Gutzkow, Gustav Freytag, and Bauernfeld. Paul Heyse, Wilhelm Jordan, Kruse, Mosenthal, Weilen, Wilbrandt, Gustav von Putlitz, and Schauffert are among the more noteworthy of the very recent dramatists. Among their works are many of positive excellence, though none for which it is possible to predict an enduring fame.—Belles-lettres, on the whole, have in recent years fallen into comparative insignificance in Germany. The most eminent minds no longer devote themselves to poetic and dramatic literature, but to the exploration of the spheres of science and learning. Alexander von Humboldt (1769–1859) gave a powerful impulse to almost all departments of knowledge by his "Cosmos," "Travels," "Views of Nature," and the general suggestiveness of his labors. While he marks a new epoch in the pursuit of the natural sciences, another great movement was initiated in historical researches by Niebuhr (1776–1831), the illustrious historian of ancient Rome; Schlosser (1776–1861), the vigorous and truthful exponent of universal history, and particularly of the history of the 18th century; Heeren (1760–1842), the investigator of history in connection

with political and commercial relations; Raumer (1781-1873), the historian of the Hohenstaufen; Leopold von Ranke (1795), whose labors embrace a vast field of modern history; Dahmann (1785-1860), the German Guizot, author of "Sources of German History," and the historian of Denmark and of the English and French revolutions; and Gervinus (1805-71), the historian of German literature, Shakespearean critic, and author of the great history of the 19th century. Here may be mentioned also Rotteck (1775-1840), whose excellent universal history has been very popular on account of its liberal political views, and Weber, the author of several universal histories. While Niebuhr introduced a profounder method in the study of early Roman history, Bunsen, Lepsius, and others made discoveries in Egyptian and oriental antiquities, and a third impulse proceeded from the active researches in the field of classical archaeology and philology. These combined influences are more or less manifest in the labors in ancient history of Böckh, Karl Otfried Müller, Duncker, Droysen, Mommsen, Kortüm, Adolph Schmidt, Plass, Wachsmuth, Tittmann, Fläthe, Manso, Abeken, Schwiegler, E. Curtius, Lassen, Jahn, Hermann, Teuffel, and Movers. In the special study of Sanskrit Roth, Böhtlingk, Benfey, Fick, A. Weber, and others have won distinction. The history of the middle ages has been treated by Rühs, Rehm, and Wilken, and more especially by Leo, Hammer, Fallmerayer, Aschbach, Lappenberg, Dahmann, Schäfer, Röpell, Kriegk, and Gregorovius. Various branches of oriental history and literature have been actively explored by Joseph von Hammer-Purgstall, Flügel, Plath, Radeloff, Ewald, and Nöldeke. Among writers on modern history are Dohm, Saalfeld, Bülow, Münnich, Häusser, and Treitschke. The humanitarian and cosmopolitan direction given to historical studies by the writers and philosophers of the 18th and 19th centuries, and especially by Herder and Kant, is manifest in the comprehensiveness of views which Rotteck, and chiefly Schlosser, bring to bear upon their labors, as well as in many works on particular sections and occupations of the people. This has culminated in what may be designated as a new science, which the Germans call *Culturgeschichte*, i. e., a history which treats of the moral, intellectual, social, and politico-economical, as well as political development of the people. Among the principal laborers in this new sphere of investigation are Wachsmuth (1784-1866), author of *Europäische Sittengeschichte* and of *Allgemeine Culturgeschichte*; Scherr, author of *Geschichte deutscher Cultur und Sitte*; Klemm (1802-69), author of *Allgemeine Culturgeschichte der Menschheit*, and of *Allgemeine Culturwissenschaft*; and Henne-am-Rhyn, author of *Culturgeschichte der neueren Zeit*. The same tendency to dwell upon the practical realities of life extends over many other departments of literature in Germany, and is most strongly expressed in recent

biographies and autobiographies, especially in that of Perthes. A more physiological method in these branches of investigation has been adopted by Riehl in his *Naturgeschichte des Volks als Grundlage einer deutschen Socialpolitik*. The literature of travels was greatly stimulated by Johann Georg Adam Forster, commonly called Georg Forster (1754-94), who accompanied Cook on his second voyage round the world, and who, in Alexander von Humboldt's opinion, inaugurated a new era of scientific voyages. A still more powerful impulse was given by Humboldt himself, by his travels in the equinoctial regions of America, and in central Asia. The travels of Lichtenstein (1780-1857) in southern Africa were of great scientific importance. The travels of Prince Maximilian of Wied (1782-1867) furnished valuable additions to the knowledge of the natural history and ethnology of Brazil and the United States. The explorations of Martius (1794-1868) in Brazil are important for the studies of botany, ethnology, geography, and statistics. Pöppig (1797-1868) visited Chili, Peru, and the river Amazon. Among the other explorers of South America are Burmeister (born 1807), who travelled more particularly in Brazil, and Johann Jakob von Tschudi (1818), a relative of Friedrich von Tschudi, author of *Das Thierleben in der Alpenwelt*, and an active traveller, especially in Peru. Sir Robert Hermann Schomburgk (1804-65), a German by birth, but employed in the service of the British government, travelled in British Guiana, Barbadoes, Hayti, &c. His works were published in German by his brother, Otto Schomburgk (1810-57). Another brother, Moritz Richard Schomburgk, travelled in British Guiana at the expense of the king of Prussia, and afterward in Australia in company with a fourth brother, Julius Schomburgk. The East has been visited by G. H. von Schubert (1780-1860), especially Egypt, Palestine, and Greece, and by Seetzen (1767-1811), whose *Reisen durch Syrien, Palästina, die Trans-Jordan-Länder, Arabia Petræa und Unterägypten*, were edited by F. Kruse. Minutoli (1772-1846) wrote on his travels to Upper Egypt. Ruppell (born 1794) explored Nubia, Kordofan, Arabia Petræa, and is best known by his travels in Abyssinia. The most eminent writers on Egypt are Lepsius, Brugsch, Baron Bunsen, Ebers, Dümichen, and Lauth. The historian Raumer gave graphic descriptions of his travels in Venice, England, Italy, and the United States; and Joseph Russegger (1802-63) wrote comprehensively on his travels in Europe, Asia, and Africa. Venedey (1805-71) gave accounts of England, Ireland, and southern France. Moritz Wagner (born 1813) has published his travels in Algeria, the Caucasus, Colchis, Persia, and Kurdistan, and, in conjunction with his companion Scherzer, in North America and Costa Rica. Froebel (born 1806) has described "Seven Years Travels in Central America, Northern Mexico, and

the Far West of the United States" (English edition, 1859). Hettner (born 1821) has written sketches of his travels in Greece. Friedrich Gerstäcker (1816-'72) is the author of many entertaining and humorous descriptions of travels, especially in the new world. Another pleasing narrator of his journeys is Mundt. A voluminous writer of travels is the tourist Kohl (born 1808). Ida Pfeiffer (1797-1858) showed herself a most intrepid and indefatigable tourist and valuable contributor to the literature of travel. Germany has also given birth to some of the most celebrated recent explorers of remote parts of the world, as Gützlaff in China, Siebold in Japan, Barth, Vogel, Nachtigall, Gerhard Rohlf, and Henglin in Africa, the brothers Schlagintweit in central Asia, Bastian in S. E. Asia, and Leichhardt in Australia.—We complete this sketch by a list of eminent men (mostly living) in the principal departments of learning, including some names already mentioned. In the natural sciences: Burmeister, Ule, Johann Müller, Carus, Rossmässler, Dove, Giebel, Masius, Valentin, Moleschott, Büchner, Vogt, Oken, Virchow, Burdach, Schleiden, Bernhard Cotta, Nees von Esenbeck, Leopold von Buch, Endlicher, Martius, Naumann, Bischoff, Liebig, Bunsen, Kirchhoff, Kopp, Poggendorff, Rose, Erdmann, Gmelin, Wöhler, Wackenroder, Gehler, Vogel, Mitscherlich, Pringsheim, Schödlér, Du Bois-Reymond, Fechner, O. Schmidt, F. Cohn, Reichenbach, Unger, Weber, Mohl, Steinheil, Rau, Pietschmann, Reich, Hagen, Lang, Karl, Schrauf, Wundt, H. Grassmann, Hallier, Kummer, Mann, Hartung, Gegenbaur, Fürbinger, Hoffmann, S. Hartmann, Haeckel, Völker, Ramelow, Kupffer, Winkler, Kunth, Fitzinger, Emmerling, Fresenius, Wagner, Meissner, Vom Rath, Baumgärtner, Erdmann, Hoffmann, Karmarsch, Würtz, Zwick, Otto, Reis, Robert Grassmann, Zirkel, G. Hartwig, Credner, Pfaff. In medicine: Johann Müller, K. Thiersch, Burdach, Wagner, Ehrenberg, Hecker, Carus, Blasius, Froriep, Schönlein, Skoda, Dieffenbach, Mitscherlich, Romberg, Weber, Donders, A. von Gräfe, Virchow, Steinthal, Reich, W. Roth, Busch, Haussmann, Armbrrecht, Klebs, Nothnagel, Schröder, Steinbacher, Kunze, Fürst, Stilling. In astronomy and mathematics: Bessel, Encke, Struve, Mädler, Galle, Gauss, Lejeune-Dirichlet, Argelander, Heis, Schmidt, Dienger, Förster, Schucht, Göbel, Osterdinger, Zollner, Greiffenstein, K. S. Neumann, Möbius, Weissbach, H. J. Klein, Volger, Bischof. In military science, engineering, &c.: Möwes, Taubert, Rebhann, Hagen, Dittmer, Schmitt, Winkler, Lieber, Zastrow. In geography, ethnology, statistics, and travels: Carl Ritter, Daniel Wappäus, Ungewitter, Berghaus, Petermann, Möller, Stein, Streit, Handtke, Löher, Raumer, Haxthausen, Dieterici, Hübner, Sydow, Möllhausen, Mauch, Munzinger, Hügel, Roon, Schweinfurth, Semper, Seemann, Ziegler, Waitz, Schmarda, Blau, Berlepsch, Pauli, Stieler, Fritsch, Stephan, Stangl, Rodenberg, Stein-

thal, Cornelius, Langhans, Hartmann. In history and biography: Wachler, Gfrörer, Pölit, Leo, K. A. Menzel, Preuss, Weber, Prutz, Varnhagen von Ense, Pertz, K. W. Böttiger, Zimmermann, Von Rochau, G. Curtius, Dittmar, Spiegel, S. Bauer, Fessler, Wolff, Jost, Zunz, Grätz, Stockmar, Honegger, Grotefend, Stahl, Elze, Ungewitter, Hagenbach, K. Mendelssohn-Bartholdy, Caspari, Kolb, Holtzendorff, Ukert, Rosenkranz, Brandes, Gentz, Nitzsch, Hirsch, Stoffel, F. Arndt, W. Müller, Wackernagel, Sybel, Kohlransch, Caro. In the history and criticism of literature, philosophy, art, and aesthetics: Gervinus, Vilmar, Wackernagel, Julian Schmidt, Solger, Bouterwek, Visscher, Schwegler, Ruge, Wolf, Koberstein, Gottschall, Stern, Schell, Kreyssig, Kurz, Lindau, Carrière, Eye, Stahr, Hauptmann, Elze, Meissner, Klein, Gervais, Ethé, Wagner, Zimmermann, Hirzel, J. W. O. Richter, Löper, Schasler, Weisse, Lenz, Liszt, J. P. Richter, Lübke, Fechner, J. H. Schmidt, H. Grimm, Eggers, Lütke, Vagler. In philology: F. A. Wolf, Schaaf, Maurer, Heinsius, Heyse, K. F. Becker, Massmann, Wilhelm von Humboldt, Zumpt, Hermann, Niebuhr, Bernhardt, Creuzer, Wachler, Con. Schneider, Ernesti, E. and G. Curtius, Matthiæ, Thiersch, Jacobs, Buttman, Rost, Passow, Kühner, Ramshorn, Döderlein, Freund, Gerhard, Gesenius, Nork, Bopp, Freytag, Jahn, Hitzig, Hupfeld, Ewald, A. F. Hoffmann, Lassen, Sachs, L. Geiger, Steinschneider, Levy, Tischendorf, Wattenbach, Lepsius, Schrader, Teuffel, Westermann, Meineke, Leo Meyer, Kremer, Obermüller, Dietz, Brambach, E. M. Arndt, Wollheim da Fonseca, Delitzsch, Holtzmann, Rödiger, Stark, Westphal, Bohtlingk, Fick, Schleicher, Schott, Cuno, Zenker, Dindorf, J. Müller, Roth, Benfey, Hildebrand, Grassmann, Quenstedt. In political sciences and jurisprudence: Savigny, Stahl, K. F. Eichhorn, Gans, Hüllmann, Welcker, Schubert, Stein, Bülow, Mohl, Gentz, Von Rönne, R. W. Dove, Holtzendorff, Gneist, the Swiss Bluntschli, Barth, Glaser, Gerber, Marx, Richter, Marr, Adler, Oppenhoff, Maurer, Mittermaier, Mohl, Perthes, Schwarze, Twisten, Joseph Unger, Richthofen. In theology, philosophy, and Biblical sciences: Fessler, Martin, Luthardt, Rothe, Hefele, Ketteler, Döllinger, Alzog, Dörner, Guericke, Schenkel, Ullmann, Strauss, Schleiermacher, Roh, Pottgeisser, Keil, Delitzsch, B. Baur, F. O. Baur, Reinke, Reinkens, Leonhardi, Schulte, Ulrici, Braubach, A. von Hartmann, Froeschammer, J. B. Meyer, Zeising, Nietzsche, Ueberweg, Stier, Aub, Krummacher, Balzer, Lange, Tholuck, Tischendorf, Friedberg, Menzel, Kirchmann, Fischer, A. Geiger, Frankel, Hirsch, Philippson, Keim, Luz, Baumann, Winer, Tuch, Kurtz, Schrader, Ludwig Feuerbach, Schopenhauer, E. von Hartmann. In the science of education: Diesterweg, Froebel, Gräfe, K. Schmidt, Fricke, Schlosser, Dillmann, Beck, Hill, Lübker, Schmeller, L. W. Seyffarth, Böhm, Schott, Westermann, Möbius, Rosenkranz, Waitz.

GERMANY, Wines of. The wine-producing area of Germany is limited chiefly to those parts watered by the Rhine and its tributaries, the Moselle, the Nahe, the Neckar, the Main, and several smaller streams, so that the terms Rhine wine and German wine may be considered almost synonymous. Bonn, in Rhenish Prussia, and Freiburg, in Baden, mark approximately the northern and southern limits of the grape culture. Both red and white wines are produced, but those known to commerce are, with a few exceptions, white. The red varieties are mostly of inferior quality and are consumed within the country. All are distinguished by their comparative freedom from alcohol, which barely exceeds 12 per cent., and at the same time by their durability, the finer growths frequently retaining their excellence for half a century or more. Liebig attributes their distinctive character and bouquet to the free acid which they contain, and their valuable hygienic properties to the tartar present in them. To this cause he ascribes the immunity enjoyed by persons dwelling on the Rhine and the Moselle, and indeed by all who use German wines, from calcareous complaints. The most favored and celebrated viticultural district in Rhineland is that known as the Rheingau, a strip of territory about 15 m. in length, and not exceeding 8 m. in width, lying between the Taunus range of mountains, in Nassau, and the right bank of the Rhine. It extends from Walluf, just below Mentz, to Lorch, 6 m. below Bingen. The river, after following a northerly course for many miles, turns abruptly at Mentz to the west, in which direction it flows as far as Bingen, when it again turns northward. Having thus a southerly exposure, and being protected from the north winds by the mountains behind it, and from the southwest winds by a range on the west bank of the Nahe, with the further advantage of having the rays of the sun reflected from the river directly upon its slopes, the Rheingau affords a site for vineyards unequalled perhaps in Europe, and has a climate peculiarly favorable to the production of the fragrant and delicate wines for which the district is famous. In connection with the Rheingau may be considered the neighboring district of Hochheim, on the north bank of the Main, about 4 m. from Mentz, and from the first syllable of which is derived the name, hock, by which all Rhenish wines were once designated in Great Britain and the United States. The vineyards of Hochheim have a southerly exposure, and are essentially an easterly continuation of those of the Rheingau. The vine appears to have been cultivated throughout this whole region as early as the 6th or 7th century, but to the monastic foundations established there during the middle ages belongs the credit of discovering and perpetuating the system of viticulture which has brought its wines to their present high degree of perfection. During the religious and civil conflicts which disturbed

Germany from the 16th century to the end of the Napoleonic wars, the most famous vineyards gradually passed from the hands of the monks to those of the dukes of Nassau, the princes of Metternich, or less distinguished proprietors. In the latter half of the last century many new vineyards were planted by persons of means from Mentz, Frankfort, and other neighboring cities; and by the conjunction of capital with intelligent labor the Rheingau has become the most highly cultivated wine-growing region, perhaps, in the world. Within a comparatively recent period the discovery has been made that the Riesling grape, which yields the bouquetted wines, develops its finest qualities only when in a state of over-ripeness, without concurrent acetification. This has led to a complete reform in the treatment of the wines in the cellar. While formerly young wine required from ten to twenty years to ripen, it is now perfected in from three to five years, with a perceptible improvement in quality. In like manner the large casks previously used, to diminish to the utmost the loss by diffusion and evaporation, have been discarded, as they were found to be impediments to the quick maturation of wine by diminishing the surface accessible to oxygen. The vineyards of Hochheim lie about three quarters of a mile from the banks of the Main, above which they are elevated 100 ft., and embrace an area of between 700 and 800 acres. The finest wine is produced on the estate known as the Dechanei, or deanery, eight acres in extent, which has an admirable exposure. The Stein, a continuation of the Dechanei, yields wines which are sometimes said to surpass the best products of the Rheingau. These vineyards, formerly the property of the dukes of Nassau, now belong to the emperor of Germany.—Entering the Rheingau proper, we find a famous series of vineyards extending from the village of Elfeld to Asmannshausen. In the centre of the district, on a gentle eminence half a mile from the Rhine, lies the estate, about 46 acres in extent, of Schloss Johannisberg, a name long associated with the choicest products of the Rhenish vines. It yields a white wine, which in respect to fulness of taste and richness of bouquet has been called "the finest and most powerful drink on earth." Johannisberg was originally a Benedictine abbey, founded in 1106, which, after various changes of ownership, became in 1815 the property of the emperor of Austria, who bestowed it upon Prince Metternich, with whose descendant it now remains. Notwithstanding the limited area of the estate, the soil varies considerably in different parts, which are marked off by stakes with numbers affixed; and the cultivation and the vintage are especially adapted to each part. A similar practice prevails in other celebrated vineyards of the Rheingau. Great care is exercised in the selection of grapes for the press, the first picking, or *Ausslese*, of over-ripe fruit yielding the highest quality of the

wine of each year. The quantity of wine annually produced has varied from 25 pieces of 240 gallons each to 60 pieces. The wines of inferior quality, produced in poor years, are sold by auction immediately after the spring racking, and only the select qualities are kept in the cellars of the estate. At the age of four or five years they are bottled, after which they greatly improve in bouquet. The largest yield was in 1857, when 60 pieces, or 14,400 gallons, realized at auction \$60,000. The difficulty of obtaining genuine Schloss-Johannisberger is very great, and large quantities of spurious wine are sold under the name. The first quality has been known to command from \$5 to \$8 a bottle; but the auction wines are much less valuable, and sell for from \$250 to \$1,000 the piece, according to the qualities they possess for mixing.—Next in reputation to the Johannisberger wine, if not its equal, is that produced on the estate of Steinberg, which until 1866 was the property of the dukes of Nassau, but in that year passed into the possession of the crown of Prussia. The Steinberg is a hill 3 m. from the Rhine, the vine-growing portion of which occupies an area not exceeding 60 acres, enclosed by a massive wall of masonry. This, with the mountain barrier in the rear, effectually screens the vineyard from chilling or injurious winds. The estate, which once belonged to the wealthy cloister of Eberbach, includes also a farm of 450 acres, maintained for the sole purpose of producing the manure necessary for the vineyard. The latter has various undulations and hollows, by which it is divided into districts yielding different qualities of wine. The soil is heavier than that of the Schloss Johannisberg, and on this account in warm seasons the ripening of the grape is not as a rule effected before the latter has reached its full maturity. The opposite result is often witnessed in the Johannisberg vineyard. Thus, during the years 1857, 1858, and 1859, which were exceptionally warm, the Steinberg wines showed a marked superiority over those of the Johannisberg. The discovery that the over-ripe grapes yield the best wine was made on this estate about 50 years ago, and since then the vintage has always been very late. In ordinary years there are two or three selections of grapes, from the first of which is made the best wine, the rest hanging 10 or 15 days longer. The annual product of the estate varies from 14,000 to 20,000 gallons, valued at \$350 to \$3,500 the piece, the latter price being paid for the choicest cabinet wines only. The *Auslese* of certain exceptionally fine years has sometimes sold in the cask as high as \$5 a bottle. The ordinary qualities, like those of the Johannisberg wine, are sold annually by auction.—Scarcely inferior to these wines are those produced on the Rüdesheim-Berg and Hinterhaus, which have a southerly exposure, and lie so near the Rhine that the reflection of the sun from the surface of the river greatly facilitates the ripening of the grape. The vine-

yards, comprising an area of about 800 acres, divided among a number of proprietors, are terraced from the base to the summit of the hills, and yield wines of considerable body and fine bouquet, the best qualities of which are high-priced. A short distance below Rüdesheim is Asmannshausen, which yields the only good red wine of the Rheingau. This is produced from the black Burgundy grape known as the *pineau noir*, whence the wine is often spoken of as a species of Rhenish burgundy. It has a soft and exceedingly delicate flavor, but like the higher class of burgundies suffers from transportation. The wines produced on the estates of Marcobrunn, Hattenheim (first growth), Gräfenberg (first growth), and Geisenheim-Rothenberg, also rank as of the highest quality, and in favorable seasons command enormous prices. Of the second growth of the Rheingau produce, the most esteemed varieties are the Johannisberg-Claus, Vollraths, and Raenthal-Berg. Among the third growths may be mentioned Hattenheimer, Winkel, Hallgarten, Rüdesheimer, Geisenheimer, Erbach, Elfeld, and Lorch, which may be regarded as the ordinary wines of commerce. In good seasons, and when the best grapes only are selected, these latter growths sometimes reach a high degree of excellence, and command a correspondingly high price.—The banks of the Rhine from Asmannshausen to Coblenz are thickly planted with vineyards, but the situations being for the most part unfavorable, little or no wine of first-rate quality is produced on this part of the river. But in the valley of the little river Ahr, which enters the Rhine about 20 m. below Coblenz, is grown a pale red wine, called the Ahr-Bleichart, having certain strengthening and astringent qualities, and an agreeable burgundy flavor.—Rhenish Bavaria or the Palatinate produces an immense quantity of wine, the yield in favorable seasons reaching 16,000,000 gallons, which is noted for its medium good quality, its purity and freshness of taste, and its cheapness. While never approaching the wines of the Rheingau in bouquet, it not unfrequently surpasses them in richness. The vineyards occupy a fertile, undulating plain, somewhat elevated above the valley of the Rhine, and bounded on the west by the Haardt mountains, a northerly continuation of the Vosges range. About 25,000 acres are under cultivation. The wines of the first growth are Rupertsberger, Deidesheimer, Wachenheimer, and Forster; of the second, Ungsteiner, Dürkheimer, and Königsbach.—Rhenish Hesse produces wines partaking of the qualities of those of the Palatinate and of the Rheingau. Well known growths are the Liebfrauenmilch, produced in and around the convent garden of the Liebfrauen-Stift, near Worms, an agreeable middle-class wine of fine bouquet; the Scharlachberger and Feuerberger of Bingen and its neighborhood; and the wines of Laubenheim, Bodenheim, Oppenheim, Nierstein, and Selzen, several of which have considerable local repu-

tation, and are often substituted for wines of the Rheingau. The district of Oberingelheim produces much red wine, resembling burgundies of the second and third class, from Burgundy grapes. The produce of the Nahe is nearly related to the middling growths of the Palatinate.—The Bavarian wines, grown in Lower Franconia, in the valley of the Main, are distinguished rather for their body and strength than for their bouquet, and are mostly consumed within the country. The only varieties exported are those produced in the neighborhood of Würzburg, where about 4,500 acres are under cultivation. The best vineyards are the Leiste and the Stein, the products of which are of fine quality and very expensive. Both are situated on the Main, and the former is principally owned by the king of Bavaria, who stores the wine made from the estate in the cellars which underlie the royal castle of Würzburg. In these cellars are more than 280 large casks, some having a capacity of 2,500 gallons. Though considered in the last century indispensable to the proper ripening of wine, they are now but little used. The Leiste wine of good quality is mostly carried to Munich and drunk at court, and only a small quantity enters into trade. The Stein wine, which is also very celebrated, is sold in short-necked bottles of a peculiar shape, called *Bocksbeutel*. Much of the wine passing under this name in England and the United States is the product of the Palatinate, which at Mentz and elsewhere is put into bottles of the shape of the *Bocksbeutel* and sold as Stein.—In Baden a large quantity of third or fourth class wine is produced, the best growth being the white Markgräfler and the Affenthaler, a light, agreeable red wine. The great tun in the castle of Heidelberg was formerly filled with a wine grown in a district known as the Bergstrasse, which commences at Zwingenberg, in the province of Starkenburg, and follows a range of hills to Heidelberg.—More than half of the wine grown in Württemberg is produced in the valley of the Neckar, and though not of high grade is agreeable to the taste and wholesome. From its changeable color it is termed Schiller.—The general character of the wines grown in the valley of the Moselle is that of thin Rhine wine. They are lighter and less spirituous than those heretofore described, and are noted for an aromatic flavor, which, however, is said to be generally communicated to the wine by mixing with it a tincture of elder flowers, called also the "essence of muscatel," because it resembles the concentrated flavor of the muscatel grape. Messrs. Thudicum and Dupré, in their "Treatise on the Origin, Nature, and Varieties of Wine" (London, 1872), say: "It must be declared with emphasis that there is not a grape of muscatel grown upon the Moselle fit for wine making; that there is not a single barrel of wine made there which naturally has the muscatel flavor; and that

all the wine having the flavor which imitates it is made up with tincture of elder flowers." The better sorts are highly esteemed in Germany for their supposed medicinal properties. The wines held in highest repute are the Brauneberger and Scharzberger, the latter grown on the Saar, a tributary of the Moselle; and scarcely less noted are the Zeltinger, Graacher, Dun, Piesporter Auslese, Josephshoff, Berncastel, Grünhausen, and Scharzhofberger. The area under cultivation comprises about 23,000 acres, yielding in favorable seasons 160 gallons to the acre.—About 50 years ago sparkling wines were first manufactured in Germany at Easingen and Heilbronn, from the Neckar grape; and the process has since been so successfully carried on that these wines may be considered in some degree the rivals of champagne. Upward of 2,000,000 bottles of sparkling Moselle and sparkling hock are annually made at Hochheim, Mentz, Coblenz, and other places, much of which, by means of false labels, is sold as champagne, and readily passes for such. The process of manufacture is precisely similar to that employed in making champagne. (See FRANCE, WINES OF.) The seasons of 1871, 1872, and 1873 were the most disastrous known to German viticulturists.

GERMERSHEIM, a fortified town of Rhenish Bavaria, at the confluence of the Queich and the Rhine, 7 m. S. W. of Spire; pop. in 1871, 6,223. It has several churches and schools, and an active trade in grain, hemp, flax, and fruits. Ship building and fisheries are carried on, and gold is washed from the sands of the Rhine. Originally a Roman stronghold, the present town was founded by the emperor Rudolph of Hapsburg, who died here in 1291. It formed part of the electoral Palatinate from 1830 to 1623, when it was conquered by Austria. From 1644 to 1650 it was occupied by the French, who retook and devastated the place in 1674 under Turenne. After the death of the elector Charles (1685), the French again claimed possession, whence arose the GERMERSHEIM war of succession, which came partly to an end through the treaty of Ryswick (1697), and finally through the arbitration of the pope (1702). It was subsequently the scene of important military operations up to July, 1793, when the French were here defeated by the Austrians. GERMERSHEIM having been made a fortress of the German confederation, works begun in 1835, together with the fortress of Landau, distant 10 m., and with a tête-de-pont on the right bank of the Rhine, make it a strong strategical position.

GERM THEORY OF DISEASE. See SUPPLEMENT.

GEROK, Karl, a German poet, born at Vaihingen, Württemberg, Jan. 30, 1815. He studied at Stuttgart, held ecclesiastical offices, and in 1868 became first preacher of the court and chief consistorial councillor. His published sermons have passed through many editions, and his religious poems, including

Pfingstrosen (4th ed., 1870) and *Palmblätter* (17th ed., 1871), have made him famous. Besides his poems *Blumen und Sternen* (3d ed., 1870), he published during the Franco-German war of 1870-'71 patriotic effusions under the title of *Deutsche Ostern*.

GÉROME, Jean Léon, a French painter, born in Vesoul, May 11, 1824. In 1841 he went to Paris and studied under Paul Delaroche, whom he accompanied to Italy. He returned to Paris in 1845, and exhibited his first picture in 1847. For several years afterward he travelled in the East, his journeys furnishing him with numerous subjects for pictures. He obtained medals in 1847, 1848, and 1855, and in the last year received the decoration of the legion of honor. In 1863 he became professor of painting in the school of fine arts, and in 1869 was decorated with the order of the red eagle. He has produced many pictures of the life of the ancients, which have placed him at the head of a school of art designated as the Pompeian or New Greek; and several of his pictures have been criticised as indelicate to the last degree. Among his works are "The Virgin, the Infant Jesus, and St. John," "Bacchus and Cupid," "A Greek Interior," the frieze of the vase commemorative of the London exhibition of 1851, "The Plague at Marseilles," "The Death of St. Jerome," and "A Lioness meeting a Jaguar." His masterpiece in historical art is "The Age of Augustus and the Birth of Jesus Christ," exhibited in 1855, and purchased by the French government. He exhibited in London in 1871 a naked Nubian girl, entitled "To be Sold," and "Cleopatra brought to Cæsar in a Basket," the latter inferior to most of his other works. One of his latest pictures, "The Gladiators," was purchased in 1873, by Mr. A. T. Stewart of New York, for 80,000 francs.

GERONA. I. A province of Spain, in Catalonia, forming the N. E. extremity of the peninsula, bordering on France and the Mediterranean, and on the provinces of Barcelona and Lérida; area, 2,272 sq. m.; pop. in 1870 (estimated), 325,110. The surface is chiefly covered with the ramifications of the Pyrenees, but fertile valleys frequently intervene. The inhabitants of the interior are mostly engaged in agriculture and cattle rearing; those of the coast in ship building, fishing, and navigation. The principal rivers are the Ter and the Fluvia. Among the towns are Rosas and Figueras, both fortified, Olot, and Ripoll. II. A city (anc. *Gerunda*), capital of the province, at the confluence of the Ter and Ona, 52 m. N. E. of Barcelona; pop. about 10,000. The chief manufactures are linen and woollen fabrics, paper, soap, earthenware, and hardware. It was captured by Charlemagne, regained by the Moors, and is famous for the sieges it has sustained.

GERRY, Elbridge, an American statesman, fifth vice president of the United States, born in Marblehead, Mass., July 17, 1744, died in Washington, Nov. 23, 1814. He graduated at Har-

vard college in 1762, and was elected in 1772 representative from Marblehead to the legislature. He at once became a political leader, and an associate of Samuel Adams, Hancock, and Warren. He was placed on the two most important committees, those of safety and supplies, which sat at Cambridge, on the day preceding the battle of Lexington. In January, 1776, he was elected a delegate to the continental congress, signed the Declaration of Independence, was placed on the most important committees, and was generally chairman of the committee of the treasury till the organization of the treasury board in 1780, of which he became presiding officer. He retired from congress in that year, but resumed his seat in 1783. As delegate to the convention which met in Philadelphia in 1787 to revise the articles of confederation, he refused to sign the constitution proposed, but lent it his support as member of congress after it had received the sanction of the people. He served four successive years in congress, and in 1795 retired to private life, residing in Cambridge, till in 1797 he was appointed to accompany Pinckney and Marshall on a special mission to France. He was invited to remain in Paris, though his associates were ordered to quit France, and he then obtained the evidence and assurances upon which the subsequent commission acted. On his return he was unsuccessfully supported by the democratic party of Massachusetts for the office of governor in 1798, and again in 1801, but was elected after an excited canvass in 1810, and was reelected in 1811. In 1812 he was elected vice president of the United States, but died suddenly in the second year of his term.

GERS, a S. W. department of France, formed from parts of Gascony and Guienne, bordering on the departments of Lot-et-Garonne, Tarn-et-Garonne, Haute-Garonne, Hautes-Pyrénées, Basses-Pyrénées, and Landes; area, 2,425 sq. m.; pop. in 1872, 284,717. The surface is in general hilly. It is watered by the Gers (which rises in Hautes-Pyrénées, and flows N. into the Garonne), Save, Adour, and several other rivers. The most important vegetable products are the cereals, flax, and onions. Fruit is scarce. Large quantities of wine and brandy are made, but of ordinary quality. The minerals are of little consequence, but gypsum and a fusible spar used in making glass and porcelain abound. The only manufactures are brandy, coarse woollens, leather, bricks, glass, and earthenware. It is divided into the arrondissements of Auch, Mirande, Condom, Lectoure, and Lombez. Capital, Auch.

GERSON, Jean Chartier de, a French theologian, born at Gerson, near Rheims, Dec. 14, 1363, died in Lyons, July 12, 1429. At the age of 14 he went to Paris to study the humanities and theology, and in 1387 he was selected by the university as one of its deputation to the antipope Clement VII. at Avignon upon the controversy concerning the immaculate conception. About 1393 he was made chancellor

of the university of Paris. Charles VI. had just fallen into insanity, and while divisions menaced the state, the church was rent by a schism which produced two and afterward three pretenders to the pontificate. Gerson exerted himself for the reform of morals and the banishment of scholasticism from the university, combated astrology, and resisted the invasion of the pantheistic doctrines which then had their seat in Brabant. When the duke of Orleans was assassinated by the duke of Burgundy in 1407, Gerson denounced the murderer and delivered the funeral oration of his victim. Pursued by John the Fearless, he saw his house pillaged, and was obliged to conceal himself in the vaults of Notre Dame. He was present in the council of Constance as theologian of the bishop of Paris; and, as the council had been convened for the purpose of electing a pope whom all Christendom would acknowledge, he urged the deposition of the two pretenders to the papacy, John XXIII. and Benedict XIII., in a treatise *De Auferibilitate Papæ*. He wished to prove that there are circumstances in which the assembled bishops of the whole church can compel pretenders to the papal dignity to renounce their claim, and depose them if they refuse to abdicate. The schism was at length ended, but Gerson's efforts to check the abuses which reigned in the church were ineffectual; and as civil dissensions did not permit his return to France, he retired to the mountains of Bavaria, where he wrote *De Consolatione Theologia*, and the *Monotessaron*, a harmony of the four Gospels. He returned to his country after a voluntary exile of two years, and found an asylum in a convent. Though one of the most active men of his age, he was also the most mystical of its thinkers. He was the first who sought to give to mysticism the character of a science. He recognized in the soul two classes of faculties: the cognitive or intellectual, whose highest act is simple intuition of divine things; and the affective faculties, whose highest act is ecstatic delight in God. To substitute this mystical philosophy for scholasticism was the aim of his writings. As many manuscripts of the "Imitation of Jesus Christ" bear the name of Gerson, that work is often ascribed to Gerson. (See KEMPTIS, THOMAS A.) See *Vie de Gerson* (Paris, 1832); O. Schmidt; *Essai sur Jean Gerson* (Strasbourg, 1839); and R. Thomassy, *Jean Gerson* (Paris, 1843). The best edition of Gerson's works is that of Dupin (5 vols. fol., Antwerp, 1706).

GERSON BEN JUDAH, a rabbi of France, distinguished by the appellations *Rabbenu* (our master), *Hazaken* (the old man), and *Meor haggolah* (light of the exiled), born in Germany about 960, died about 1080. He wrote a commentary on the Talmud, of which only slight fragments remain, and is celebrated for the introduction of various reforms among the European Jews, including the abolition of polygamy and repudiation, known under the name of "institutions (*gezeroth*) of Rabbenu Gerson."

GERSTÄCKER, Friedrich, a German traveller and novelist, born in Hamburg in May, 1816, died in Vienna, May 31, 1872. After a brief term in a commercial school he was apprenticed to a grocer in Cassel; but becoming dissatisfied, he ran away on foot to Bremen, and in the spring of 1837 engaged as cabin boy on board a vessel bound for New York. He led a wandering and adventurous life in the United States for several years, a part of which was spent as a hunter and trapper among the savages of the Indian territory. In 1842 he bought a hotel at Point Coupée, Louisiana; but this having proved a bad speculation, he returned in 1843 to Germany and engaged in literary pursuits, publishing *Streif und Jagdzüge durch die Vereinigten Staaten Nordamerikas* (1844); *Die Regulatoren in Arkansas* (1846); *Mississippibilder* (1847); *Die Flusspiraten des Mississippi* (1848); *Amerikanische Wald- und Strombilder* (1849); and several minor works and translations. In March, 1849, he set out on a journey around the world, during which he visited South America, California, the Hawaiian islands, Australia, and Java, and returned to Germany in 1852, making his residence at Leipsic. An account of this trip was published under the title of *Reisen* (5 vols., 1853-'4). During the succeeding four years he published a number of novels. In 1860 he made an extensive tour through South America, visiting Ecuador, Peru, Chili, Uruguay, and Brazil, and returned home the following year. In 1862 he accompanied Duke Ernest of Gotha to Upper Egypt, Nubia, and Abyssinia, and in 1863 he visited the Central American states. He set out in 1867 on another journey around the world, visiting first the United States, Mexico, and South America. He went thence to the Pacific isles, and after an extended tour returned to Europe, and published a number of novels illustrative of the countries through which he had passed. Some of his later works are: *Neue Reisen durch die Vereinigten Staaten, Mexico, Ecuador, Westindien und Venezuela* (1868); *Die Missionäre* (1868); *Die Blauen und die Gelben* (1870); *Buntes Treiben* (1870); *In Mexico* (1871); *Hamburger Nachrichten* (1871); *Herrn Mahlhübers Reiseabenteuer* (1871). Several of his works have been translated into English.

GERSTER, Etelka. See supplement.

GERVINUS, Georg Gottfried, a German historian, born in Darmstadt, May 20, 1805, died in Heidelberg, March 18, 1871. He was educated at the university of Heidelberg, and in 1835 was appointed extraordinary professor, after spending several years in Italy. He had already published *Geschichte der Angelsachsen im Ueberblick* (1830), and *Historische Schriften* (1838), and in 1836 he was appointed professor of history and literature at Göttingen. He had now begun *Die Geschichte der poetischen Nationalliteratur der Deutschen* (1835-'8), which was supplemented by the *Neuere Geschichte*, &c. (1840-'42). In the latest edition (5 vols.,

Leipsic, 1871) these two works are comprised under the general title *Geschichte der deutschen Dichtung*. In them the author traces the development of poetry in its relations to the progress of civilization and of society. He lost his chair at Göttingen in 1837 by signing the famous university protest against the abolition of the Hanoverian constitution. In 1838 he made another journey to Italy, renewed his historical researches at Rome, and returned to Heidelberg, where he became honorary professor in 1844. He now took part in the political affairs of Germany, advocating liberal ideas. In 1847 he was one of the founders of the *Deutsche Zeitung*, the organ of the constitutional party, and in 1848 was elected a member of the Germanic diet, and subsequently of the parliament at Frankfort, and had a prominent part in forming the constitution eventually adopted by the latter assembly. In 1850 he went to England, where he made unsuccessful efforts in behalf of the duchies of Schleswig and Holstein, and on his return to Heidelberg resumed his historical writings. Among his later works are: *Shakespeare* (4 vols., 1849-'50); *Geschichte des neunzehnten Jahrhunderts* (8 vols., 1855-'66, besides an introductory volume published in 1854), beginning with the fall of Napoleon and brought down to the year 1831; *Händel und Shakespeare* (1868); and *Händel's Oratorientexte*, published posthumously by his son in 1873.

GESENIUS, Friedrich Heinrich Wilhelm, a German orientalist, born in Nordhausen, Feb. 3, 1786, died in Halle, Oct. 23, 1842. He studied at the universities of Helmstedt and Göttingen, and was appointed in 1806 *magister legens* at Göttingen, in 1809 professor of ancient literature in the gymnasium of Heiligenstadt, in 1810 subordinate, and in 1811 ordinary professor of theology in the university of Halle, where he remained to the end of his life. Devoting himself to the study of the Semitic languages, and particularly of the Hebrew, Gesenius founded a new school of Biblical exegesis, chiefly based on an accurate, rational, and historico-critical study of philology. His works are: "Hebrew and Chaldaic Lexicon for the use of the Old Testament" (2 vols., Leipsic, 1810-'12; 4th German ed., 1834; 2d Latin ed., 1846; translated into English by J. W. Gibbs, Andover, 1824, and by Edward Robinson, Boston, 1836; new and greatly enlarged editions, 1850 and 1855); "Elementary Course of the Hebrew Language" (2 vols.), comprising a "Hebrew Grammar" (Halle, 1813; 16th ed. by Rödiger, Leipsic, 1851; translated into English by Moses Stuart, Andover, 1826, and by T. J. Conant, Boston, 1839), and a "Hebrew Reader" (Halle, 1814; several times republished by different editors); "Critical History of the Hebrew Language" (Leipsic, 1815; 2d ed., 1827); *De Pentateuchi Samaritani Origine, Indole et Auctoritate* (Halle, 1815); "Grammatico-critical System of the Hebrew Language" (2 vols., Leipsic, 1827); "Transla-

tion of the Prophet Isaiah, with a Philologico-critical-historical Comment" (3 vols., Leipsic, 1820-'21); *Scripturae Linguaeque Phœnicia Monumenta* (3 vols., Leipsic, 1837); and *Thesaurus Philologico-criticus Linguae Hebraicae et Chaldaicae Veteris Testamenti* (3 vols., Leipsic, 1829-'53; part of vol. iii. by Rödiger).

GESNER, Konrad von, a Swiss naturalist and philologist, born in Zürich, March 26, 1516, died there, Dec. 13, 1565. He studied at Zürich, Strasburg, Paris, Basel, and Montpellier, and was successively master of a school at Basel, teacher at Lausanne, and practising physician and professor at Zürich. His first important work was *Bibliotheca Universalis* (Zürich, 1545-'9), containing the titles of all the books then known in Hebrew, Greek, and Latin, with criticisms, summaries, and specimens. In 1555 appeared his *Mithridates de Differentiis Linguarum*, having accounts of 130 ancient and modern languages. His most important work, *Historia Animalium*, published between 1551 and 1556, is a summary of all that was then known of zoölogy. His *Opera Botanica* (published by Schmiedel, Nuremberg, 1753-9) gives particular attention to the flower and the fruit, and suggests the possibility of a classification by means of the organs of fructification.

GESNER, Salomon, a Swiss painter and poet, born in Zürich, April 1, 1730, died there, March 2, 1788. His father attempted in vain to engage him in his own business of bookselling, and allowed him to follow his inclination for poetry and landscape painting. He resided successively at Berlin, Hamburg, and Zürich, first becoming known by his poem *Die Nacht*, which was followed by *Daphnis*, a pastoral in three cantos, by *Idyllen*, *Der Tod Abels* in prose, some moral tales and dramas, and lectures on landscaping. Some of the engravings with which he illustrated his poems are excellent.

GETA, P. Septimius. See CARACALLA.

GETÆ, a Thracian tribe mentioned by Herodotus and Thucydides as living S. of the Ister (Danube), and by later writers among the tribes N. of that river. Some critics regard them as identical with the Dacians, others with the Goths. Rawlinson, in his notes on Herodotus, favors the latter opinion, and points to the "striking analogy of the compounds Massagetæ, Thyssagetæ, and Tyrigetæ, to the later names of Visigoths and Ostrogoths."

GETHSEMANE (from Heb. *gath shemen*, oil press), a garden or olive plot near Jerusalem, and across the brook Kedron, to which Jesus with his disciples often repaired, notably on the night of his betrayal. The brook Kedron runs through a deep ravine, parallel with and about 200 yards from the E. wall of Jerusalem. Immediately beyond it rises the steep side of Olivet, which is still cultivated in rude terraces. The garden or olive patch of Gethsemane must have been situated somewhere on the slope. The precise spot is still an open question. There is a modern garden in which

are eight ancient olive trees, with several younger ones, which have been planted or have sprung up from the roots of older trees. This spot was several years ago bought by the Latin church, and laid out in walks and flower beds. In it is pointed out the grotto of the agony, excavated in the rock, the descent to which is by a flight of rudely cut steps. The form of the interior is circular, about 15 ft. in diameter, the roof, supported by pilasters,

Gethsemane.

being perforated to admit light. The Armenian and Greek churches deny that this is the true site of Gethsemane, and they have fixed upon another place a little to the north. Dr. Robinson thinks that the site claimed by the Latins is that believed to be the true one by Eusebius and Jerome, and as likely to be so as any. Dr. Thomson thinks both sites are too near the city, and that Gethsemane was in the secluded valley still further to the northeast.

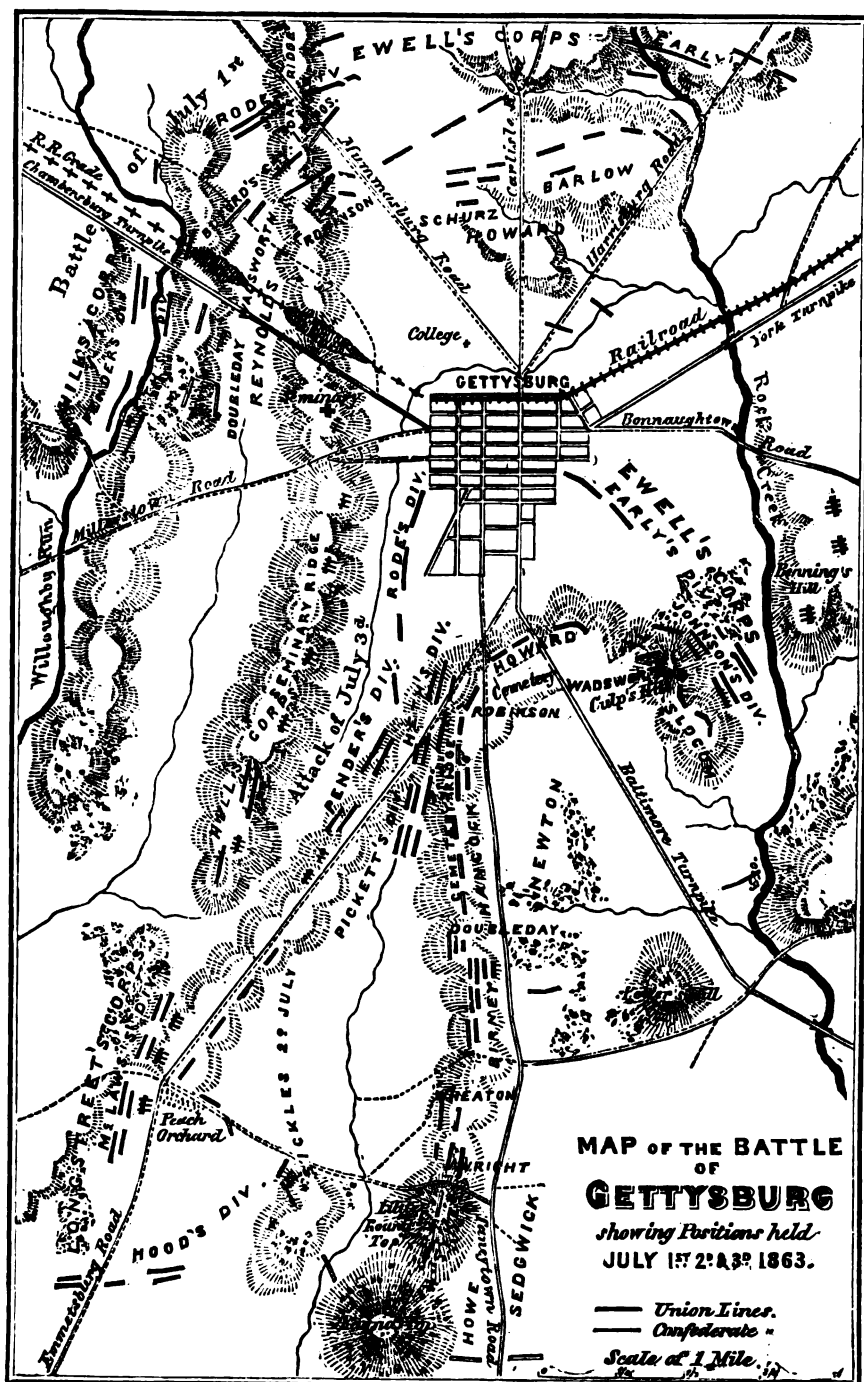
GETTYSBURG, a borough and the capital of Adams co., Pennsylvania, situated on elevated ground in a rich farming country, at the terminus of the Susquehanna, Gettysburg, and Potomac railroad, 86 m. S. W. of Harrisburg; pop. in 1870, 8,074. The court house and public offices are commodious brick structures; the residences are generally neat and substantial. The borough is extensively engaged in the manufacture of carriages, is supplied with good water conveyed in iron pipes from a neighboring spring, and has two national banks, a female seminary, two weekly newspapers, a theological quarterly, and eight churches. It is the seat of Pennsylvania col-

lege (Lutheran), founded in 1832, and having in 1871-'2 11 professors and instructors (8 in the preparatory department), 92 collegiate and 87 preparatory students, and libraries containing 18,800 volumes; and of a Lutheran theological seminary, founded in 1825, and having 4 professors and 2 lecturers, 46 students, a library of 10,100 volumes, and an endowment of \$100,000. The buildings belonging to these institutions are large and beautiful edifices. The national cemetery, containing the remains of Union soldiers who fell in the battle of Gettysburg, occupies about 17 acres on Cemetery hill adjacent to the village cemetery, and was dedicated with imposing ceremonies, and an impressive address by President Lincoln, Nov. 19, 1863. A monument occupying the crown of the hill, dedicated July 4, 1868, is 60 ft. high, and is crowned with a statue of Liberty. At the base of the pedestal are four buttresses, surmounted by statues representing War, History, Peace, and Plenty. Around the monument, in semicircular slopes, are arranged the dead, the space being divided by alleys and pathways into 22 sections, one for the regular army, one for the volunteers of each state represented in the battle, and three for the unknown dead. The number of bodies interred here is 8,564, of which 994 have not been identified. Adjoining the national cemetery is a national soldiers' orphans' homestead, founded at the close of the war by benevolent contributions of Sunday schools and individuals, containing usually about 100 orphans. One mile W. of the borough, near the spot where Gen. Reynolds fell on the first day of the battle, are the Gettysburg springs, whose waters, denominated katalysine, have acquired a wide reputation for their medicinal qualities. A fine hotel near by accommodates the patients who resort in large numbers to these springs during the summer. Since the battle Gettysburg has attracted tourists from all parts of the world.

GETTYSBURG, Battle of, fought July 1, 2, and 3, 1863, between the Union army of the Potomac under Gen. Meade, and the confederate army of Northern Virginia under Gen. Lee. After the battle of Chancellorsville (May 2-4, 1863), the confederates resolved upon an invasion of the north, believing that a decided success there would bring the war to a speedy close. Their whole disposable force except that in the west was to be employed in this enterprise. Southern Virginia and North Carolina were almost stripped of troops to augment the army of Northern Virginia, and early in June a force of nearly 100,000 men, of whom 15,000 were cavalry, was concentrated in the vicinity of Culpeper. This was nearly the largest and by far the best organized and equipped army which the confederacy ever placed in the field. It was formed into three corps, under Longstreet, Ewell, and A. P. Hill, the cavalry being commanded by Stuart. It began to move slowly down the valley of the Shenandoah, whereupon Hooker, who then

commanded the Union army, broke up his camp opposite Fredericksburg, and moved northward, on a line parallel with that of Lee, the Blue Ridge being between them. Lee endeavored by an ostentatious stretching out of his force to induce Hooker to pass the mountains and assail him. Finding this unavailing, he moved toward the Potomac, Winchester being the point of concentration of all his corps. Milroy, with 10,000 men, had been lying here, where on June 15 he was assailed by the confederate van, and his force dispersed, losing 2,300 prisoners. Raids were then made into Maryland and Pennsylvania, meeting with so little resistance that an invasion in force of Pennsylvania was resolved upon. On the 24th and 25th the Potomac was crossed at two points, almost within sight of the battle field of Antietam. The two columns, uniting at Hagerstown, Md., pressed on toward Chambersburg, Pa. Hooker on the 28th also crossed the river lower down, and headed toward Frederick City, Md. Lee had by this time gone so far from the river as to leave his communications exposed, and Hooker resolved to fall upon these rather than precipitate a general battle. There were at this time 10,000 Union troops at Harper's Ferry, who could be of no use there. Hooker asked that these should be united with his army. The request was refused by Halleck, who was then general-in-chief, and Hooker thereupon sent in his resignation, which was accepted, and on June 28 Meade was appointed in his place. The confederate corps of Ewell had in the mean while reached Carlisle, Pa., and was preparing to advance to Harrisburg, while Longstreet and Hill halted at Chambersburg. The position was now such that Meade by a rapid march could throw his whole force in Lee's rear, isolating him in a hostile country, and cutting off his sources of supply. Lee perceived that the movement northward could be carried no further until he had routed the army which hung menacingly upon his flank and rear; and he resolved to concentrate his whole force in the direction of the enemy, Gettysburg being fixed upon as the place of union. Meade, learning of this movement, resolved to concentrate his columns, which were spread over a wide space, a part under Reynolds being at Gettysburg, and a part under Sedgwick 35 m. southward. The advance was to be drawn back, and the rear brought forward to a point on Pipe creek, 15 m. S. E. of Gettysburg, where Meade resolved to await the attack of the enemy. Lee was wholly ignorant of the position of his enemy; for when he crossed the Potomac, Stuart with the cavalry had been left behind to harass the Union rear, in Virginia, and then to cross the river and rejoin the army at Carlisle. Stuart, crossing at a point below that where Hooker had just crossed, found the enemy between him and Lee, and could reach Carlisle only by making a wide detour; on reaching it, July 1, he found it

evacuated, and the army in movement toward Gettysburg, whither he hastened, but arrived too late to take part in the actions of the first two days.—JULY 1. On the morning of July 1 Hill, whose corps was in the advance, learned that Gettysburg, from which he was distant about 6 m., was occupied by a Union force. Sending back to urge Longstreet to hasten his march, he moved on. In the mean while Reynolds had sent out a cavalry reconnoissance in the direction whence Hill was coming, and the forces came in collision about 2 m. N. W. of Gettysburg. Reynolds sent infantry to the support of his cavalry, and the action opened. He was killed at the beginning of the fight, and the command here devolved upon Howard. At first the Union forces were superior, and they gained decided advantages, taking nearly 1,000 prisoners. But in a few hours nearly the whole of Hill's corps came up from Chambersburg, and Ewell's from Carlisle, both numbering about 50,000, while their opponents were less than half as many. The Union force was driven back in confusion through Gettysburg, losing about 5,000 prisoners. The remainder took up a strong position on Culp's hill, just south of the town. The Union loss in this action was about 10,000, half of whom were killed and wounded. The confederate loss in killed and wounded was probably somewhat greater; in prisoners much less. Meade, who was 15 m. distant, had learned that there was fighting at Gettysburg, and sent Hancock with orders to take command of the force there, and to decide what should be done; for, as it happened, Meade knew nothing of Gettysburg. Hancock decided that this was the place to give battle, and sent back word to Meade to hurry all his troops to the place. Some of these came up during the night, others early in the following morning, and finally, after a march of 35 m., Sedgwick's corps in the afternoon. Lee had in the mean while suspended operations until he could bring up his whole army.—JULY 2. Early in the morning the bulk of the two armies was in position. Southward of Gettysburg, at the distance of a mile, rises Cemetery ridge. It curves first northward, then westward, and finally runs southward, the whole length being about 3 m., the shape being like a fish hook. It rises in places into several craggy hills, each having its own name. That on the extreme south, forming the stem of the fish hook, is Round Top, separated by a ravine from Little Round Top; at the bend of the hook is Cemetery hill; Culp's hill forms the barb. The Union army was posted along the whole line of Cemetery ridge. Opposite this is Seminary ridge, upon which the greater part of Lee's army was posted; Ewell's corps, however, lay at the foot of Culp's hill, 2 m. distant. The forces present or close at hand were about equal, each numbering from 70,000 to 80,000 infantry and artillery. Between the two ridges is a valley in which and on the slope of Cemetery ridge were fought the



actions of July 2 and 3. It is clear from what followed that Lee greatly underestimated the force opposed to him, and he resolved to attack it in its strong position. Longstreet was to assail the Union left at Round Top, while Ewell was to make on the right, at Culp's hill, "a demonstration, to be converted into a real attack should opportunity offer." Meade had intended that his line should be posted on the ridge directly between Round Top and Cemetery hill. But this ridge, in the centre where Sickles was placed, is comparatively low, sinking down into a valley a few hundred yards wide, beyond which rises another wooded crest running diagonally to the former; and Sickles supposed this to be the one which he was to occupy. Before the error could be corrected the confederate attack had begun, and Meade decided to support Sickles in his present position, although it left an unoccupied space between him and Round Top. As it happened, Hood's division of Longstreet's corps struck this opening. Moreover, by some mischance Little Round Top had been left unoccupied, and this was the key to the entire Union position; for if the enemy could seize this, and place a few guns upon it, the whole line would be enfiladed. The confederates perceived this, and began to swarm up the rugged sides. But just in time Warren, who as engineer was examining the line, discovered the error, and brought up a few regiments. They reached the summit just a moment ahead of the enemy, and forced them back. Again and again until nightfall the assault was unsuccessfully renewed. In the mean time the remainder of Longstreet's corps were pressing fiercely upon Sickles, who was soon borne from the field with his leg shattered. His corps made a stubborn resistance, but was forced back until it reached the crest of the ridge, where a new line was formed. The confederates charged this, but were met with a fire from which they recoiled. Hancock, who now commanded the centre, ordered a countercharge, by which the enemy were driven back to the ridge previously occupied by Sickles, which they continued to hold. Ewell's demonstration on the Union right was delayed until the action on the left was nearly over; but as most of the Union force had been withdrawn from Culp's hill to aid Sickles, he succeeded in effecting a lodgment within the Union intrenchments. The Union loss in this action was fully 10,000, half of which was in Sickles's corps, which lost nearly half its numbers. This action decided nothing; for the ground which the confederates had won on the Union left was never meant to be held by Meade, and he would gladly have withdrawn from it without a fight; and Ewell's foothold on the Union right was of no importance unless it could be followed up. Still the confederates had gained some apparent advantages; and, says Lee, "These partial successes determined me to continue the assault the next day." From what he could then know, he was justified in this; for he had

every reason to suppose that he had encountered the entire Union force, while less than half of his own had been engaged.—JULY 3. Lee's general plan of attack was similar to that of the preceding day. Ewell was to follow up his advantage, while the main attack was to be made on the centre. But early in the morning Meade had taken the offensive against Ewell, and forced him from the foothold which he had gained. By some unexplained accident Lee was never informed of this mishap, by which a third of his force was left out of action, while Meade was at liberty to concentrate his whole strength upon any point which might be assailed. All the morning was spent in preparation. Seminary ridge formed an admirable position for the confederate artillery, and here directly in front of the Union line they placed 120 guns. A great part of Cemetery ridge is so rugged that artillery could not be placed there; so that although Meade had 200 guns, he could use only 80 at a time. At 1 o'clock the confederates opened fire, which was immediately returned. Many of the Union guns were disabled, but their place was supplied by others. The infantry were so well sheltered behind the crest that they suffered little. After two hours, Hunt, the chief of artillery, gradually suspended fire, "in order to see what the enemy were going to do." Lee, supposing that the Union batteries had been silenced and that the infantry must be demoralized, now ordered the grand attack of the day. This was to be made mainly by Pickett's division of Virginia veterans, who had not yet been engaged. They were to be aided by the brigades of Wilcox and Pettigrew. Exclusive of Wilcox, who did not fairly advance, the attacking column numbered about 18,000. Lee had intended to advance his artillery to support the infantry, but found at the last moment that the ammunition was nearly exhausted, and there was no time to replenish it. The column moved swiftly down the slope of the ridge, and across the plain. All the Union batteries, from Round Top to Cemetery hill, opened upon them, ploughing great furrows through their lines, which were closed up as fast as made. The column at first headed for the left of the Union centre, where Doubleday was posted with 2,500 men, a little in advance of the main line and protected by breastworks of rails and stones. To avoid this the column bent to its left and exposed itself to a severe flank fire. Still it pressed on, until Pettigrew's brigade was within 300 yards of Hancock's line, which had reserved its fire. In five minutes the whole brigade was streaming back in wild disorder. Pickett's division pressed steadily on until it reached Gibbon's front line thinly posted behind a low stone wall. They charged straight over this, among the federal batteries, and for a quarter of an hour there was a struggle with pistols and clubbed muskets. The Union troops hurried from all sides and drove the enemy back down the slope, which was completely

commanded by musketry and artillery. To advance, retreat, or stand still was alike impossible. The men flung themselves on the ground, holding up their hands in token of surrender. Of the whole number, not one in four escaped; the others were dead or prisoners. The attacking column being thus utterly routed in the centre, Meade ordered his right to advance and drive back the division of Hood, which had been held in check upon the ridge they had won the preceding day. This was easily done, and many prisoners were captured. The confederate loss this day was about 16,000 in killed, wounded, and prisoners; the Union loss was about 8,000. During the night Lee concentrated his force behind the crest of Seminary ridge, awaiting and probably desiring an attack. In the morning Meade called a council of war, by which it was decided to "remain a day and await the development of the enemy's plan." Before night a heavy storm set in, under cover of which Lee began his retreat to the Potomac, leaving a strong rear guard to defend the passes through the mountains. He reached the river, 40 m. distant, on the 7th. The stream, which he had crossed almost dry-shod a fortnight before, was now swollen by unusually heavy rains and unfordable. A bridge which he had flung across had been destroyed by a cavalry dash from Harper's Ferry, and he had no alternative but to intrench himself and await an attack or the falling of the waters. Meade advanced slowly by a much longer route, and on the 12th came in front of the confederate intrenchments. He called a council of war, which, against his opinion, voted to postpone the attack until reconnaissances had been made. On the evening of the 13th an order was issued for an advance the next morning; but when day broke the enemy had disappeared. A slight bridge had been constructed, and the river had fallen so as to be fordable at a single point. Ewell's corps crossed by the ford, the others by the bridge. The remains of the confederate army stood safe on the other side; and the invasion of the north, upon which so much had been staked, was at an end.—The Union loss at Gettysburg, was 28,190, of whom 2,834 were killed, 13,718 wounded, and 6,648 missing. The confederate loss has never been officially stated; but by the best estimates it was about 36,000, of whom about 5,000 were killed, 23,000 wounded, and 8,000 unwounded prisoners. The entire number of prisoners, wounded and unwounded, was about 14,000.—At almost the same moment when the final action at Gettysburg took place, the negotiations for the surrender of Vicksburg were concluded. These twin disasters mark the epoch of the decline of the confederacy.

GEYSERS (Icelandic, *geysa*, to burst forth violently), intermittent hot springs found in various parts of the world. In Iceland the principal geysers are in the S. W. part of the island, about 85 m. N. W. of Hecla, and 70 m. from Reykiavik, the chief town. In a circuit

of about two miles are more than 100 springs which send forth hot water, 50 or more in the space of a few acres. These are on the lower slope of a small hill of trappean rock, and above them in the steeper part of the hill under the cliffs of this rock are banks formed by the incrustations of ancient and now nearly extinct geysers. The springs are of different dimensions, and exhibit various degrees of activity; some are uniformly full and quiet, others are constantly boiling, and others only at intervals, with explosive discharges of water and steam. The vapors rising from them form clouds that are seen miles away. They are attended with sulphurous odors; and the geysers of other localities on the island deposit sulphur derived from the decomposition of the iron pyrites in the clays through which the hot waters penetrate. The chief spouting springs of the group are the Great geyser and the Great and Little Strokr. The Great geyser when quiet presents the appearance of a circular mound of silicious incrustations, enclosing a pool, with sides sloping inward at an average angle of 18°, and outward at a mean inclination of 8°. The height of the mound is about 20 ft. on the lower side, but only half as much on the upper side. The diameter of the basin varies from 50 to 60 ft., and its average depth is 4 ft. In its centre is the mouth of the vertical tube which connects it with the subterranean passages. This tube is about 9 ft. in diameter at its mouth, and 70 ft. in depth. When the geyser is inactive, the basin is filled to the edge with clear water, which has a mean temperature of 185° F. and runs gently down the mound, emitting clouds of steam; but for several hours after an eruption the tube is empty to the depth of 4 or 5 ft. At intervals of about an hour and a half a rumbling noise is heard, and the water heaves up in the centre, throwing an increased quantity over the margin. The great eruptions take place at irregular intervals, sometimes exceeding 80 hours. At these times loud explosions are heard beneath the surface, the water is thrown into violent agitation, it boils furiously, and at last is suddenly sent forth in a succession of jets, which increase in force till they become an immense fountain that is lost to view in the clouds of steam in which it is enveloped. The heights reached by these jets have been variously estimated by different travellers. The lowest estimate is 60 or 70 ft.; that of Von Troil in 1772 is 92 ft.; of Sir John Stanley in 1789, 96 ft.; of Lieut. Ohlsen, a Danish officer, in 1804, determined by a quadrant, 212 ft.; of Sir George Mackenzie in 1810, 90 ft.; and of Henderson in 1815, 150 ft. Later visitors, Lord Dufferin, Mme. Ida Pfeiffer, J. Ross Browne, and others, estimate the height at from 60 to 70 ft. The eruptions appear to be diminishing in force and frequency, and it is not improbable that they will cease altogether before the lapse of another century. The discharge continues only about five minutes, when the geyser subsides to a state of tranquil-

lity. The Great Strokr, so named either from the Icelandic word meaning churn, or from *stroka*, to agitate, is only 300 or 400 ft. from the Great geyser, from which it differs in appearance in being an irregularly formed well, incrustated with silicious deposits, but having no basin at its mouth. Its orifice is about 8 ft. in diameter, diminishing to about 10 in. at the depth of 27 ft.; the whole depth is a little over 44 ft. The water for the greater part of the time is 10 or 12 ft. below the surface, and is continually boiling and seething, but at intervals of about half a day it breaks forth in a great eruption, throwing its water generally from 40 to 60 ft.; but Bunsen, who saw it in 1846, estimates it to be 151 ft. high. By throwing turf or stones into the well of the Strokr, an eruption can be brought on in a few minutes. The Little Strokr exhibits the same phenomena on a smaller scale. In the same vicinity are two large and quiet wells remarkable for their beautifully blue water. These were once active, and one of them is described by an English traveller as the Roaring geyser. It became tranquil immediately after an earthquake in 1789, when the Great Strokr first broke forth. The deposits of silica which accumulate around the geysers are derived from the small amount of this material which is taken up in solution by the hot water. By the analysis of Dr. Black, made upon 10,000 grains (about $5\frac{1}{2}$ gills), it would appear that the whole amount of solid matter remaining dissolved in the cold water is only a little more than $\frac{1}{1000}$ of the whole, the quantity examined yielding as follows: soda, 0.95; alumina, 0.48; silica, 5.40; muriate of soda, 2.46; dry sulphate of soda, 1.46; in all, 10.75. An analysis of the geyserite, or solid deposit, made by Forchhammer, gave the following result: silica, 84.48; water, 7.88; alumina, 8.07; iron, 1.91; lime, 0.70; soda and potassa, 0.92; magnesia, 1.06; total, 99.97. As the water evaporates and is chilled, the excess of silica is added to the surface around, filling the interstices of the mosses and grass, and making of these silicious petrifications, while the living plants still thrive and shoot above the strong substance that binds together their roots and stems. Where the waters are found at a temperature of 98° C. (208.4° F.), M. Descloiseaux observed that the *conferva* still flourished. The true theory of the cause of geyser eruptions is due to Bunsen. When in Iceland in 1846, he proved by a series of careful experiments that the temperature of the water in the geyser tube varies at different depths, as also at different periods between two eruptions, the changes always taking place in the same manner and with considerable regularity. Immediately before the eruptions there is a maximum temperature at the bottom of the well estimated at 260.6° F., and a minimum immediately after of 253.4°. The temperature of boiling water at the depth reached by the thermometer should be about 276° F. The water therefore in no part of the tube is

hot enough to generate steam under the conditions. But the higher you ascend in the tube, the lower is the temperature at which water will boil. If then the column be thrown up by the generation of steam in the underground channels, the water at the bottom, which is near the boiling point, is brought to a height where it is sufficiently relieved from pressure to be converted into steam. The water in the tube is lifted still higher, until the steam condenses by contact with the cooler water, to which it imparts its latent heat. Each condensation makes a detonation, the subterranean explosion which precedes an eruption. By successive efforts enough of the superincumbent column is thrown off to raise nearly all the water in the tube to the boiling point, until at last the relief from pressure is sufficient to permit the ejection of the contents of the tube. This ejection continues until all the reservoirs around the geyser are emptied, when it subsides until the proper conditions are established again. A boiling spring becomes in time a geyser if, in building up around itself a mound of precipitated mineral, it forms a vertical tube of sufficient height and regularity to give a certain pressure of confined water; and when the tube reaches such an altitude that the water below cannot, in consequence of the increased pressure, reach the boiling point, the eruptions cease and the geyser becomes a mere cistern. It is a singular fact in the history of Iceland that no mention is made of the geysers until they are spoken of by Svenson, bishop of Skalholt, in the 17th century; and this is the more remarkable, as Ari Frode, who wrote of the geography and history of the island in the 11th century, spent his youth in their immediate vicinity. They bear unmistakable evidences of having been in operation in this district, if not in the exact places where they are now found, from remote periods.—The geysers of New Zealand are in the island of New Ulster, the most northerly of the group. About the centre of the island, near the ever active volcano of Tongariro, thermal springs, mud fountains, and geysers rise in more than 1,000 places, exhibiting phenomena more remarkable than those in Iceland. A portion of Lake Taupo boils and smokes as if heated by subterranean fires, and the average temperature of its water is about 100° F. North of it, a valley through which the Waikato river flows contains a great number of geysers, 76 having been counted in one group. These jets of water are of various height, and play alternately. About half way between the lake of Taupo and Plenty bay, on the coast, is the little lake of Rotomahana, covering 120 acres, whose temperature, raised by the hot springs which feed it, is about 78° F. This lake is surrounded by springs and fissures, from which steam, sulphurous gases, water, and mud are continually escaping. The most remarkable of these, the Tatarata (tattooed rock), is at the N. E. end of the lake, about 80 ft. above its

level. It is described by Von Hochstetter as a crater-like excavation, with steep reddish sides, 30 to 40 ft. high, which are open toward the lake only. The basin of the spring is about 80 ft. long and 60 wide, and is filled to the brim with clear transparent water, which against the white incrustated sides appears of a beautiful blue color. Immense clouds of steam continually rise from it, obstructing the view of the surface, and the noise of boiling is always audible. At the margin the temperature is 183° F., but in the centre, where the water is continually in a state of ebullition to the height of several feet, it probably reaches the boiling point. The deposit, like that of the Iceland springs, is silicious, and the incrustations made by the overflow have formed on the slope a system of terraces, from 2 to 6 ft. in height, as white and almost as regular as if cut from marble, on each of which are circular basins, resplendent with blue water. These terraces, which cover an area of about three acres, have the appearance of a cataract plunging over natural shelves, which as it falls is suddenly turned into stone. Each stage has a small raised margin, from which slender stalactites hang down on the next below. At ordinary times but very little water ripples over these terraces, and only the principal discharge on the side forms a hot steaming fall; but sometimes, say the natives, the whole body of water is thrown up in an enormous column, emptying the pool. On the highest stage is an extensive platform, with a number of basins, from 5 to 6 ft. deep, the water showing a temperature of from 90° to 110° F. In the middle of this platform rises, close to the brink of the main basin, a rock island, about 12 ft. high, covered with mosses and ferns. From it a full view may be had of the interior of the boiling caldron, without danger. The rocks from which these springs derive their silica are rhyolites and rhyolithic tufas, which contain over 70 per cent. of it. An analysis of the solidified incrustation of the Tatarata, made by Mayer, gave the following result: silica, 84.78; water and organic substances, 12.86; sesquioxide of iron and alumina, 1.27; lime, magnesia, and alkalies, 1.09; total, 100.—In the United States, volcanic boiling springs exist in numerous localities west of the Rocky mountains. In the Colorado desert, between lat. 33° and 34°, and lon. 115° and 116°, are remarkable mud volcanoes and boiling springs. The desert at this point is below the level of the sea. The springs cover a space not more than a quarter of a mile square. This area is covered with soft mud, through which water and steam are constantly escaping, with a noise audible at a distance of ten miles. In some places the vapor rises steadily, with a sharp hissing sound; in others it bursts forth with a loud explosion, throwing water and mud to the height of 100 ft. Some of the boiling springs throw up a column of water 20 or 30 ft.; some have cones formed around them, and

some have basins 100 ft. in diameter, in which the blue paste-like mud is ever bubbling and hissing. Many are incrustated with carbonate of lime, others with deposits of sulphur. The steam which rises from them is strongly impregnated with sulphur. Similar springs exist in New Mexico and in some of the other territories.—The so-called geysers of California are in Sonoma county, in a lateral gorge of the valley of Napa, called the "Devil's Cañon," near the Pluton river. The narrow ravine, which is always filled with vapor, is shut in by steep hills, the sides of which, marked with evidences of volcanic action, are smoking with heat and bare of vegetation. A multitude of springs gush out at the base of the rocks. Hot and cold springs, boiling springs, and quiet springs lie within a few feet of each other. They differ also in color, smell, and taste. Some are clear and transparent, others white, yellow, or red with ochre, and still others are of an inky blackness. Some are sulphurous and fetid in odor, and some are charged with alum and salt. The "Steampipe" is an orifice in the hill-side, about 8 in. in diameter, from which a volume of steam rises with a continuous roar to a height varying from 50 to 200 ft. In a cavity called the "Witches' Caldron" a mass of black fetid mud is ever bubbling with heat, the vapor from it depositing black flowers of sulphur on the rocks around. The surface of the ground about the springs, which is too hot to walk upon with thin shoes, is covered with the minerals deposited by the waters, among which are sulphur, sulphate of magnesia, sulphate of aluminum, and various salts of iron. These springs, none of which are properly geysers, are about 1,700 ft. above the sea.—The geysers at the head waters of the Yellowstone and Missouri rivers are probably the most wonderful on the globe, even those in Iceland and New Zealand sinking into insignificance when compared with them. The country lying between lat. 43° and 47° N., and lon. 110° and 114° W., comprising portions of the territories of Idaho, Wyoming, and Montana, is dotted with groups of hot springs, the remains of most remarkable volcanic manifestations, which began probably in the tertiary period. Earthquake shocks are still common throughout this region, and at some seasons of the year are very severe. The most of these springs are not geysers, but simply boiling mineral springs and mud volcanoes. The geysers proper are in the N. W. corner of Wyoming territory, on the Fire-Hole river, the middle fork of the Madison, which is one of the three principal sources of the Missouri. The basin in which they are situated was visited first by a party under Cook and Folsom in 1869. In 1870 Gen. Washburne, surveyor general of Montana, explored it with a party, among whom were Lieut. G. O. Doane and N. P. Langford; and in 1871 it was surveyed by Dr. F. V. Hayden, United States geologist, and by Col. J. W. Barlow and Capt. D. P. Heap, of the United States engineer corps. Dr. R. W. Raymond,

United States commissioner of mining statistics, also visited and described the region in the same year. The geysers lie in two large groups, in what are called the upper and lower geyser basins. The lower basin, beginning near the junction of the East and Middle forks of the Madison, comprises an area of about 80 sq. m. The springs are divisible into three classes: 1, those which are constantly boiling; 2, those which are agitated only at particular periods; 3, those which are always tranquil. In the geysers proper the water is usually quiet until a short time before an eruption. Dr. Peale, who examined them in 1871, in connection with Prof. Hayden, divides the springs into seven principal groups. In the first group, at the N. end of the basin, the temperature of 67 springs, occupying a space of about a quarter of a mile wide by two miles long, was recorded. The lowest was 106° F., the highest 198°. The temperature of the air was 50°. Some of these are geysers, projecting the water from 2 to 5 ft., but most of them are simply silicious springs, a few being chalybeate. The second group, which lies 2½ m. further S., nearer the centre of the basin, occupies an area of about

The Thud Geyser.

three fourths of a mile. Sixteen springs here ranged in temperature from 140° to 196°. The temperature of the air was from 55° to 66°. This group is composed principally of geysers, many of them throwing water from 5 to 10 ft. high. The principal one, on the slope of a hill, is about 20 ft. in diameter, with a rim 5 ft. wide and 5 ft. high. The column of water thrown from it is very wide, and reaches the height of 50 ft. Another is named the Thud geyser, from the dull suppressed sound given off as the water rises and recedes. It has a beautiful scalloped rim, with small basins around it. This group of geysers is said to resemble a factory village, the steam rising in jets from more than 100 orifices. The third group lies three fourths of a mile S. E. of the second, at the base of a spur of the mountains, and extending up a ravine about 1,000 yards. They cover a space 500 yards in width. The temperature of 20 springs ranged from 180° to 196°. Near the centre of the group is a small lake, 600 ft. long by 150 wide, on the E. shore of which is a geyser spouting to the height of from 15 to 20 ft. There are three sulphur springs here, the

only ones in the region, and S. E. of the lake is an iron spring. About 1,000 yards further S. is the fourth group, in a ravine about 1½ m. long and 800 yards wide. It contains many springs and geysers, the temperature of 42 of which ranged from 112° to 198°, the temperature of the air being about 60°. The principal geyser is at the mouth of the ravine. Its basin is circular and about 60 ft. in diameter, and its spring, in the centre, from 15 to 20 ft. The water is blue, and is constantly agitated. When in eruption the column is projected 100 ft. high, and is accompanied by immense clouds of steam. Near the upper end of the ravine is a spring around which the deposit is black, instead of the usual white. The fifth group, on the banks of the Fire-Hole river, is the largest of all, covering nearly a square mile and comprising a great number of springs and geysers. The temperature of 95 examined ranged from 112° to 196°, the air at the time being 70°. None of them are of much importance. One, from its resemblance to a shell, is named the Conch spring; its basin is triangular, from 8 to 10 ft. in diameter. A little below it, on the bank of the river, there is a fine geyser, with a crater 8 ft. high. The Horn geyser has a crater like a horn, about a foot in diameter at the top and 6 ft. at the base; it is in constant ebullition. The Bath spring has a square basin 30 ft. across, of unknown depth. The Cavern has a basin 15 by 20 ft. wide and 20 ft. in depth; the water is of a bright blue tint, and of wonderful clearness. The mud springs of this group are from an inch or two to 20 or 30 ft. in diameter, their contents varying from turbid water to stiff mud. They are in a constant state of agitation. The mud is of different colors, being pure white in some, in others brown, black, or blue. The sixth group is 2 m. S. W., on a small stream flowing into the Fire-Hole. They are in an open, prairie-like valley, for the most part marshy. The temperature of 34 of the springs varied from 106° to 198°. One of them is strongly chalybeate. The seventh group is on the Fire-Hole river, about 2½ m. S. of the preceding. The temperature of 20 of the springs ranged from 182° to 196°, when the air was from 70° to 76°. The largest has a basin over 400 ft. in diameter. Below it is another huge spring, named the Caldron, the view of which is almost obscured by the dense clouds of steam rising from it. The upper geyser basin lies in the valley of the same river, about 8 m. S. of the lower basin. It is not so large as the latter, covering an area of only about 8 sq. m., and it contains fewer springs; but the phenomena exhibited are far more remarkable. Most of the springs and geysers are near the river, extending along on both banks about 3 m. The temperature of 106 of them ranged from 113° to 196°, the average being over 170°, the temperature of the air being 67°. At the head of the valley, at its southern extremity, stands Old Faithful, a geyser so called for its regu-

larity; it spouts at intervals of about an hour, throwing a column of water 6 ft. in diameter to a maximum height of 180 ft., and holding it up by a succession of impulses from 4 to 6 minutes. The great mass of the water falls directly back into the basin, flowing over the edges and down the sides in streams. When the action ceases, the water recedes out of sight, and nothing but the occasional hiss of steam is heard until the time approaches for another eruption. Its crater is a conical mound of geyserite about 12 ft. high, measuring at the base 145 by 215 ft. and at the top 54 by

den witnessed three eruptions, which lasted from $4\frac{1}{2}$ to 15 minutes; he measured the height of but one, which was over 100 ft. He describes the column as fan-shaped, and says that no water falls from it, but it is resolved into spray which appears to evaporate as soon as formed. At 200 yards from the Beehive is the Giantess, a large geyser with an oval aperture described by Langford to be 18 by 25 ft. in diameter. The inside of the tube is corrugated and covered with a whitish silicious deposit. When not in action, no water can be seen in its basin, although its sides are visible to the depth of 100 ft., but a gurgling sound can be heard at a great distance below. When an eruption is about to take place, the water rises in the tube with much spluttering and hissing, sending off vast clouds of steam. It will stand sometimes for several minutes within 40 or 50 ft. of the surface, foaming and gurgling, and spurting jets of hot water nearly to its mouth. When it finally bursts forth, it throws up a column of water the full size of its aperture to the height of 60 ft., and through this rise five or six smaller jets, varying from 6 to 15 in. in diameter, to the height of 250 ft. The eruption, which takes place at irregular intervals, continues for about 20 minutes. Dr. Hayden, who examined it in August, 1872, says the basin measures $23\frac{1}{2}$ by $32\frac{1}{2}$ ft. in diameter, and that the water in it, which is level with the rim, is 68 ft. deep. The only eruption witnessed by him lasted 17 minutes, and the maximum height of the water was 89 ft., the steam rising to 69 ft. After the eruption the water sank 20 ft. in the basin. It probably differs in appearance in different seasons. Further down the river on the same side is the Sawmill geyser, which throws a small stream 10 or 15 ft. high almost uninterruptedly. Near it is the Grand geyser, one of the most powerful in the basin. Within a single basin 52 ft. in diameter are two orifices. One, which is oblong, $2\frac{1}{2}$ by 4 ft., has no rim, and is surrounded for the space of 10 ft. by rounded masses of silica, from a few inches to 8 ft. in diameter, looking like spongi-form coral. When not in eruption the water in this spring is quiet and is as clear as crystal. This is the Grand geyser. The second, called the Turban geyser, is 20 ft. from the first. It has a basin of irregular form, 28 by 11 ft. in diameter and 6 ft. deep. The mouth of its tube, which is at one side of the basin, is 4 by 8 ft. wide. This spring, which apparently has no connection with the former, is in a state of agitation as often as once in 20 minutes, and throws its water to the height of from 15 to 25 ft. It is never wholly quiet. The two eruptions of the Grand geyser witnessed by Prof. Hayden's party in 1871 occurred at an interval of 82 hours. In 1872 three eruptions seen by Hayden took place at intervals of 22 and $26\frac{1}{2}$ hours. An eruption is preceded by a rumbling and a shaking of the ground, followed by a column of steam shooting up from the cra-



The Giantess.

20 ft. Near it are four extinct geyser cones. On the opposite side of the river are the Beehive and the Giantess. The former is a silicious cone 3 ft. in height, 20 ft. in circumference at the base, and 3 by 4 ft. in diameter at the top, with an oval orifice 3 by 2 ft. in diameter. When in action, which occurs once in about 24 hours, it throws a column of water entirely filling the crater to a height which, says Langford, was found by triangular measurement to be 219 ft. The eruption lasted 18 minutes, and the stream did not deflect more than 4° or 5° from a vertical line. Dr. Hay-

ter, immediately after which the water bursts forth in a succession of jets, apparently 6 ft. in diameter at the bottom, and tapering to a point at the top, to a height of from 175 to 200 ft., while the steam ascends to 1,000 ft. or more. This immense body of water is kept up to this height for about 20 minutes, when it gradually recedes and again becomes quiescent. On the opposite side of the river is the Castle, so called from its resemblance to the ruins of a tower. It stands upon a platform measuring 75 by 100 ft. and 3 ft. in height, above which it rises about 12 ft. Prof. Hayden witnessed three eruptions of this geyser in 1872. The maximum height of the first was 34 ft., and of the second 93 ft.; that of the third was not ascertained. The eruptions lasted each about an hour and 20 minutes. The Giant geyser has a rugged crater, like a broken horn, 10 ft. in height and 24 by 25 ft. at the base. The top is about 8 ft. in diameter, with an irregular orifice of 5 or 6 ft. in width. The cone is open

The Giant Geyser.

on one side, having a ragged aperture from the ground upward. Its discharges are irregular, and continue for irregular periods. When Prof. Hayden saw it in 1871, it played an hour and 20 minutes, throwing the water 140 ft.; but Lieut. Doane, who visited it the year before, states that it played $3\frac{1}{2}$ hours at one time, to a height varying from 90 to 200 ft. The Grotto, the Punch Bowl, the Riverside, the Soda, and the Fan geysers, and numerous others which have not yet even been named, merit notice. There are wonderful groups also on the S. W. side of Shoshone lake, the head of one of the principal forks of the Shoshone or Snake river; and on Gardiner's river are some of the most remarkable springs in the world. The springs in action among the latter are not so numerous nor so powerful as those of the Fire-Hole basin, but are far more wonderful in their calcareous deposits, which exceed even those of the New Zealand geysers. In one place a hill 200 ft. high has been formed

in a system of terraces, ornamented with semi-circular basins, and with beadwork of beautiful colors on a snow-white ground. These calcareous deposits cover an area of about two miles square. The active springs extend from the margin of the river to an elevation of 1,000 ft. above, the highest being 6,522 ft. above the sea. The geysers of the Fire-Hole basin are from 6,800 to 7,000 ft. above the sea. The valley of the Madison, with its branches, is shut in by high volcanic mountains, gashed with deep gorges, strewn upon their sides and at their bases with fragments of trachyte and obsidian, and covered with tall pines. Between the sources of the Madison and the Yellowstone these mountains rise to 9,000 or 10,000 ft. above the sea. The valley of the Fire-Hole river is covered with the silicious deposits of the springs, and resembles an alkali flat. The bed of the stream is lined with white silica. Beneath this formation are lake or local drift deposits, and still lower basalt. The surface deposit is chiefly geyserite. The most of it is of an opaque white color, but in the lower basin pink specimens are found which are translucent. Some of it is greenish gray and some pearly, like enamel; and it assumes forms similar to those in Iceland. Some have a cauliflower-like form, and break very easily; others are beaded, and others covered with small stalagmitic processes. The texture varies from porous to compact, the most being porous and arranged in layers. The geyser cones are generally compact, and often have an enamel-like coating. A specimen of the white geyserite, of cauliflower form, contained silica 83.88, water 11.02, chloride of magnesium 4; total, 98.85. The water contains very little solid matter. A specimen brought back by Dr. Peale was as clear as when bottled at the springs, showing no deposit; it contained 835 $\frac{1}{2}$ milligrammes of solid matter to the litre, consisting mainly of silica; chloride of lime and sulphate of magnesia were present in small quantity, and there was a slight trace of iron.—The geysers of Iceland are treated of in "Letters on Iceland," by Von Troil (1772); "Travels in Iceland," by Sir George Mackenzie (1810); "Journal of a Residence in Iceland during the years 1814 and 1815," by Ebenezer Henderson; "Visit to Iceland in the Summer of 1884," by John Barrow, jr.; "A Visit to Iceland," by the Hon. A. Dillon (1840); observations of M. Descloiseaux in *Annales de chimie et de physique* (April, 1847), and "Philosophical Magazine" (vol. xxx. p. 397); "Tracings of Iceland and the Faroe Islands," by R. Chambers (1856); "A Yacht Voyage," by Lord Dufferin (London, 1858); "Iceland, its Scenes and Sagas," by Sabine Baring-Gould (1863); "The Land of Thor," by J. Ross Browne (1867); and "A Summer in Iceland," by C. W. Pajkull, translated from the Swedish by the Rev. M. R. Barnard (1868). For an account of the New Zealand geysers see *New-Seeland*, by Ferdinand von Hochstetter (Stuttgart, 1868). For

geysers in the United States, see report of Lieut. G. C. Doane (1871), and the fifth and sixth annual reports of the "United States Geological Survey of the Territories," by F. V. Hayden (1872 and 1873).

GFRÖRER, August Friedrich, a German historian, born in Calw, March 5, 1808, died in Carlsbad, July 10, 1861. He studied theology at Tübingen from 1821 to 1825, was appointed in 1828 tutor in the theological seminary of that city, in 1830 librarian at Stuttgart, and in 1846 professor of history in the university of Freiburg. His first work, *Philo und die jüdisch-alexandrinische Theosophie* (2 vols., Stuttgart, 1831), was written from the critical standpoint of the Tübingen school; but while preparing his *Geschichte des Urchristenthums* (8 vols., 1838), he changed his views, and arrived at length, during the publication of his *Allgemeine Kirchengeschichte* (4 vols., 1841-'6), at the opinion that the Roman Catholic church is the true church of Christ; but he did not join that communion till 1858. Besides the works already mentioned, he wrote *Gustav Adolf, König von Schweden* (2 vols., 1835-'7); *Geschichte der ost- und westfränkischen Karolinger* (2 vols., Freiburg, 1858); *Urgeschichte des menschlichen Geschlechts* (2 vols., Schaffhausen, 1855); *Papst Gregor VII. und sein Zeitalter* (7 vols., 1859-'61); *Geschichte des 18. Jahrhunderts* (edited by Weiss, 8 vols., 1862-'3); and *Zur Geschichte deutscher Volkrechte* (edited by Weiss, 2 vols., 1866).

GHADAMES, or **Gadames**, a town of Africa, in an oasis near the S. E. corner of the Algerian part of the desert of Sahara, about 800 m. S. W. of Tripoli; pop. about 7,000, mainly Arabs, Moors, and negroes. It contains many gardens, several hot springs, six mosques, and seven schools. Woollen goods are manufactured, and there is a large trade in ivory, wax, hides, ostrich feathers, caoutchouc, &c. The adjacent region abounds with relics of Roman cities, and the town is believed to occupy the site of the ancient Cydamum. It retains considerable importance from being the focus of four commercial roads. The first crosses Fezzan, the second passes through the great desert and leads to Timbuctoo, the third connects with Lake Tchad, and the fourth passes S. of the Atlas chain of mountains, and connects with Morocco.

GHARA. See **SUTLEY**.

GHARDEIA. See **GARDAIA**.

GHAUTS (literally, mountain pass; whence, through the Teutonic languages, the English word *gate*), the name of two ranges of mountains in S. Hindostan. The principal of these is the Western, which extends nearly 1,000 m. N. N. W. from near Cape Comorin to the river Taptee, at the mouth of which is Surat. The general direction of the chain is parallel with the coast of the Indian ocean, which it approaches in one place within 6 m.; but it is for the most part at a distance of 20 to 40 m. On its western side it presents a front which

rises boldly from the hilly country between the ranges and the coast; but on the east it gradually slopes away, or spreads in table land, having an average elevation of about 3,000 ft. above the sea, or is continued in long spurs, which stretch out through this central region, known as the Deccan. The country on the west, which embraces the Malabar coast, is comparatively low, its average elevation being roughly estimated at 200 ft. above tide. It is hilly, but also penetrated by creeks and bays making back from the sea; and it is traversed by extensive ravines, which are shaded with forest and jungle. But few gaps break the continuity of the chain, and only one of these is deep enough to drain the waters on the E. slopes into the Indian ocean. This point is in the S. part of the range against the Coimbatore country, from which the river Ponany flows through a break 16 m. wide. Opposite this break it is thought that ships navigating the Indian ocean experience the N. E. monsoons in greater fury than elsewhere. The average height of the Western Ghauts is estimated at 4,000 ft., but some of the peaks rise much higher. Bonasson is said to be 7,000 ft. high, and Dodabetta in the Neilgherries 8,760 ft. The range is not remarkably rough or rocky. A deep rich soil covers the surface, and even upon the summits supports stately forests. The bamboo attains an unusual height; the teak covers the mountain sides; and on the lower hills are forests producing pepper, cassia, frankincense, and other aromatic spices and gums. In the most elevated regions no undergrowth or jungle is encountered, but roads are maintained only at great cost, owing to the violence of the torrents of water during the rainy season; hence the passes across the range are few and difficult. These are occupied by fortresses.—The Neilgherries, among which are some of the most elevated peaks of the range, occupy a tract of some 7,000 sq. m. E. of the main chain N. of Coimbatore. Here the Eastern Ghauts are usually regarded as diverging from the Western; but some trace them further S. through the Carnatic in the range of hills which meet the Western Ghauts a short distance from Cape Comorin. Both this range and the Neilgherries extend across toward the Coromandel coast, meeting near lat. 12° N., and thence the chain of the East Ghauts continues with the coast, some say even to Balasore, which is within 125 m. of Calcutta; but it is commonly regarded as running out before reaching the river Kistnah, the range being thus limited to about 500 m. in length. Its hills are naked and rocky, and seldom attain the altitude of 3,000 ft. The drainage of this region is all toward the bay of Bengal. The S. W. monsoons commence in May and June, with terrific storms of thunder and rain, which vent their greatest fury upon the Western Ghauts. This continues until October, and during this time that part of the Coromandel coast under the lee of the

Eastern Ghauts receives no rain. In October these winds fail, and the regular N. E. trades or monsoons set in with terrible thunder and lightning and hurricanes on the bay of Bengal, producing while they last, which is to about the close of the year, the rainy season on the Coromandel coast and the Eastern Ghauts. But under the lee of the western range this is the dry season, a season of fair weather with occasional southern gales. The quantity of rain which falls on the Western Ghauts during the summer is unequalled in any other part of the world in the same length of time. At the station of Mahabuleswar it has been found to measure 289 inches.—In their geological structure both ranges of the Ghauts appear to agree with other great N. and S. mountain chains of the world. Their rocks are the metamorphic schists, which contain rich metals and valuable ores. Gold is diffused along their course, and is especially abundant in the Neilgherries. Copper ores are worked in the Eastern Ghauts in the neighborhood of Cuddapah. In the same region of the Carnatic diamonds have been found; and 8° further N. is Golconda, celebrated as the depot of precious gems found in the regions watered by the Pennar and Kistnah rivers. From the table lands of Mysore, which border the Eastern Ghauts on the west, are brought the ruby, topaz, chrysolite, cat's-eye, garnet, beryl, &c. The region of the carnelian is in the province of Guzerat, which is beyond the N. extremity of the Western Ghauts, the outlet of which is Cambay. (See CARNELLIAN.) The famous diamond region of Pannah in Bundelcund is also beyond the limits of the Ghauts, in the Vindhya mountains, which, stretching across central Hindostan, connect the N. terminations of the E. and W. chains. Rich iron ores are found in abundance along the Ghauts.

GHAWAZI. See ALMER.

GHAZEPOOR, or *Ghazeepore*, a town of British India, in a district of the same name, division of Benares, Northwest Provinces, situated on the left bank of the Ganges, 42 m. N. E. of Benares; pop. about 40,000. It stands on high ground, enclosed by beautiful groves of banyan and pipal, and is noted for its healthy climate; but it presents a mean appearance, the principal buildings being in ruins and the dwellings being mostly of mud. The Chales-toon, or palace of the 40 pillars, at the east end of the town, now ruinous but used as a custom house, is the only edifice worthy of notice. In the plain N. of the town is a monument to Lord Cornwallis, who died here in 1805.—The district, which is contiguous to Azimgurh, Shahabad, Benares, and Jaunpore, has an area of 2,187 sq. m.; pop. in 1871, 1,487,388. It is a low, level country, with many shallow lakes, drained by the Ganges and its tributaries, the Gogra, Karamnassa, Tons, &c. The chief productions are rose water and attar of roses, grain, rice, indigo, oil seeds, gram, tobacco, cotton, opium, and sugar.

GHEE, a kind of butter used in many parts of India, prepared generally from the milk of buffaloes. The milk is successively boiled, cooled, and mixed with a little curdled milk. The process is completed by churning the curdled mass, to which some hot water is once added. It is an article of commerce in India, but unpalatable to Europeans from its strong smell and flavor. It may be kept from rancidity by boiling till all the water is evaporated, and then adding curdled milk and salt, and preserving it in close jars.

GHEEL, a town and commune of Belgium, in the province and 26 m. E. by S. of the city of Antwerp; pop. in 1867, 11,200. It has several churches and some manufactures. The commune has been from the 18th century a sort of asylum for insane persons, who are lodged and boarded in the houses of the peasantry, by whom in many cases they are employed in field and other labor.

GHENT (Flem. *Gend*; Fr. *Gand*; Ger. *Gent*), a city of Belgium, capital of the province of East Flanders; pop. in 1871, 123,765. It is situated at the junction of the Scheldt and the Lys, 80 m. N. W. of Brussels, and intersected by a great number of navigable canals, which communicate with those rivers, and form 26 islands connected with each other by about 80 bridges. The streets are spacious, and the fantastic variety of gable ends, rising stepwise or ornamented with scroll work and carving, imparts great picturesqueness to the stately houses. It has about 800 streets and 30 public squares, fine promenades, and a great number of churches. The sumptuous cathedral of St. Bavon contains the masterpieces of Jan and Hubert van Eyck. The city hall, with its Moorish front, the famous belfry, and the *Vrydagse markt*, or Friday square, where Jacob van Artevelde kindled the flames of civil war, and where the duke of Alva lighted the fires of the inquisition, are celebrated for their historical associations. The city is rich in charitable, industrial, artistic, literary, and scientific institutions, and possesses a university attended by about 400 students, with an extensive library and a botanical garden. There are about 20 public hospitals, of which that called Bylogne, founded in 1225, can accommodate 600 persons. The *palais de justice*, the central prison, and the Béguinage, the principal establishment in Belgium of the Beguin nuns, are worthy of special mention. The cotton manufacture employs upward of 30,000 persons. Sugar refining is also extensively carried on. The principal articles of trade are corn, oil, seeds, wine, and Flemish linens.—Ghent is first mentioned as a town in the 7th century. Toward the end of the 12th century it became the capital of Flanders, subsequently joined the Hanse league, and obtained the free navigation of the Rhine and other privileges; and by the end of the 18th century it had so much increased in wealth and power that it surpassed Paris. Charles V. was born

in Ghent, as was also John of Gaunt, "time-honored Lancaster," who derived from it his appellation. As early as the latter part of the 14th century, Froissart estimated the number of fighting men that Ghent could bring into the field at 80,000. Under Jacob van Artevelde it revolted against the count of Flanders, and, with all Flanders, maintained its independence from 1388 to 1445. The revolt was renewed under his son Philip in 1382. (See ARTEVELDE.) Soon afterward it passed into the possession of the dukes of Burgundy, against whom it rose in vain in 1450. At the end of the 15th century there was no town in Christendom to be compared with it for power, political constitution, or the culture of its inhabitants. By its jurisdiction over many large but subordinate towns, Ghent controlled more than its own immediate population, which has been estimated as high as 200,000. The consti-

tution of the city was very liberal, and in all but name it was a republic. All this prosperity was destroyed by the insurrection that broke out in 1589, occasioned by an attempt to force upon Flanders the payment of 400,000 ducats, being the third part of a subsidy granted by the Netherlands to Charles V. This claim was resisted by Ghent as a violation of the great charter granted to the city by Mary, sister of the emperor and regent of the Netherlands. Charles V. punished this resistance by depriving the city of all its privileges and immunities (1540). A number of the principal citizens were executed; the revenues, and all property held by the corporation or the traders in common, were confiscated; the ancient form of government was abolished; the right to appoint the city magistrates was vested in the crown; a new system of laws and political administration was established; and or-

The Place St. Pharaïde, and Gateway of the Old Castle of the Counts of Flanders.

ders were given for erecting a strong citadel in order to bridle the revolutionary spirit of the population. A fine of 150,000 ducats, in addition to the 400,000, was imposed upon the citizens, as well as an annual contribution of 6,000 for the support of the garrison. A congress assembled in Ghent in 1576 to form a confederacy for the expulsion of the Spaniards from the Netherlands. The massacre of Antwerp and the eloquence of the prince of Orange produced a quickening effect upon its deliberations, which had proceeded with decorum while the citadel was being cannonaded. The latter fell on the same day (Nov. 8, 1576) which saw the conclusion of the treaty known as the "Pacification of Ghent," and in the following year it was razed to the ground. In the stormy period which followed, in which the revolt against the Spanish authority was varied by

intestine dissensions, the city became a prey to riot and anarchy. Early in the spring of 1584 a formal resolution was passed by the government of Ghent to open negotiations with Spain, and within three months after the murder of William of Orange, whose policy had saved the city on many occasions, it fell into the hands of the duke of Parma, the Spanish viceroy (Sept. 17, 1584). The citadel was rebuilt, and about a third of the population left the city. In 1598 Ghent, with the other cities and provinces of the Netherlands, was severed from the Spanish crown in favor of Isabella, daughter of Philip II., who married Albert, son of the emperor of Germany. Louis XIV. took it in 1678, but restored it soon after to Spain in the peace of Nimeguen. During the war of the Spanish succession, at the end of which it was given by the treaty of Rastadt to Austria, Ghent was

alternately in the hands of both contending parties. It was also taken by the French in the war of the Austrian succession, and twice in the campaigns of the revolution, when it became the capital of the French department of the Scheldt. After the downfall of Napoleon in 1814 it was attached to the kingdom of the Netherlands. During the hundred days Louis XVIII. took refuge in Ghent. The revolution of 1830 made Ghent, with Flanders, a part of the new kingdom of Belgium. Ghent is associated with American history by the treaty concluded there, Dec. 24, 1814, which terminated the second war between Great Britain and the United States.

GHERARDESCA, *Ugolino della*, an Italian partisan leader, died in Pisa in 1289. His ancestors originally came from Tuscany and removed to Pisa as prominent Ghibellines. In order to secure his supremacy in Pisa, he induced the Guelph leader Giovanni Visconti to marry his sister, but he and his brother-in-law were expelled. Aided by the forces of Florence and Lucca, he soon gained victories over the opposing faction, and was recalled to Pisa in 1276. In the warfare between Pisa and Genoa in 1284 he contrived the defeat and capture of the Pisan squadron near the island of Meloria (Aug. 6). The Pisans, unaware of his perfidy, continued to accord him their confidence, and he again betrayed them by ceding a number of castles and forts to the enemies of the republic, who thereupon established a protectorate over Pisa with his connivance. His grandson Nino de Gallura led an unsuccessful revolt against him in concert with both Ghibelline and Guelph leaders; and Ugolino wreaked unsparing vengeance on his opponents. Ruggiero Ubaldini, the archbishop, whose nephew had been one of the victims, subsequently headed a general rising against Ugolino, who was at last (July 1, 1288) arrested, together with his sons, Gaddo and Uguccione, and three grandsons. At the instigation of the archbishop they were doomed to starvation in the Gualandi tower, hence called *torre di fame*. Dante describes their terrible death in the 33d canto of the *Inferno*.

GHERIAH, or *Viziadroog*, a town and fort of the province of Bombay, British India, in the collectorate of Rutnagherry, South Concan, 170 m. S. of Bombay. It has a safe harbor at the mouth of the river Kunvee, unobstructed by a bar and with a depth of three or four fathoms. The fort, built by the Mahratta chief Sevajee in 1662, stands on a bold promontory on the coast of the Indian ocean. It received the name of Gheriah from the Mohammedans, while by the Mahrattas it was commonly known as Viziadroog. During the maritime contests of the latter people with the Mogul emperors in the 17th century, one of their chieftains, named Conajee Angria, revolted against the Mahrattas with part of the fleet, and made himself master of the coast from Tanna to Rajapoor. Under this adventurer and his suc-

cessors, who all bore the family name of Angria, Gheriah became the centre of a vast system of piracy, which infested the adjacent seas for upward of 50 years. Several attempts were made to disperse the corsairs. The Portuguese and English attacked them in 1719, and the English again in 1722; the Dutch in 1724. In March, 1755, a British fleet, followed by some Mahratta vessels, attacked the Angria's fleet at Severndroog. The pirates escaped by fast sailing, but the town was bombarded and partly burned. Toward the end of the same year reinforcements arrived from England, and the reduction of Gheriah was at once determined upon. On Feb. 11, 1756, Admiral Watson, with 800 Europeans and 1,000 sepoys commanded by Col. Clive, arrived off the promontory, while a Mahratta army approached on the land side. The pirate fleet was soon burned; a furious bombardment silenced the guns from the fort; the troops were landed, and on the 13th the place was taken. It was given up to the peishwa under a treaty concluded with the Mahrattas the same year, and passed with the rest of his dominions into the hands of the East India company in 1818.

GHIBELLINES. See GUELPHS AND GHIBELLINES.

GHIBERTI, *Lorenzo*, an Italian sculptor, architect, and painter, born in Florence about 1380, died there about 1455. The son of a goldsmith, he early learned to imitate ancient medals, and began to exercise himself in painting. The signory and merchants of Florence determined in 1401 to procure for the baptistery of San Giovanni a bronze folding door to correspond with that already made by Andrea Pisano, for which a prize was offered. Each artist was allowed a year in which to execute a panel in bronze representing in bass relief the "Sacrifice of Isaac." Ghiberti was proclaimed victor even by his most eminent rivals, Donatello and Brunelleschi. Intrusted therefore with this immense labor, he devoted 21 years to its accomplishment, dividing each half of the door into ten panels, each of which contains a bass relief representing a subject taken from the New Testament. In 1424 this door was placed in one of the side entrances of the baptistery, and its success led to his being commissioned to execute another. This was commenced in 1428, was divided into ten panels filled with subjects from the Old Testament, occupied him nearly as long as the other, and was superior to it, being declared by Michel Angelo worthy to be the gate of paradise. During the 40 years that he was engaged upon these doors he executed several other works in bronze, among which were a statue of John the Baptist, two bass reliefs for the cathedral of Siena, a "St. Matthew" and "St. Stephen," and the reliquary of St. Zenobius surmounted by six angels. The last, and the "St. Matthew" and the second door of San Giovanni, are the masterpieces of modelling in the 15th century, and the door is perhaps still unrivalled. As an architect,

Ghiberti was associated with Brunelleschi in constructing the cupola of Sta. Maria del Fiore. He excelled in painting upon glass, and in the goldsmith's art. He also left a treatise on sculpture, a part of which has been published by Cicognara; a treatise on proportions, yet unpublished; and a treatise on Italian art, first published in 1841.

GHILAN, a province of Persia, bounded N. by Russia, E. and N. E. by the Caspian sea, S. E. by the province of Mazanderan, S. and S. W. by Irak-Ajemi, and N. W. by Azerbaijan. It is about 120 m. long and 40 m. wide; pop. about 100,000. Its inland boundary on the south and west is formed by the Elburz range of mountains, averaging from 8,000 to 8,000 ft. above the sea. The interior is covered, excepting where cleared for cultivation, with dense forests, and much of the country is level and swampy. The rainfall is excessive, and the climate unhealthy. In the woods lurk the tiger, the panther, the wild boar, and the jackal; and the marshes are filled with wild fowl. The soil is fertile, and the productions include barley, hemp, hops, fruits, and especially rice, the production of which has more than doubled since 1865, on account of the failure of the silk crop, which, however, has greatly improved since 1870. There are extensive sturgeon fisheries along the Caspian, but they are mostly in the hands of Russians. There are few towns, most of the people living in small hamlets. The capital, Resht, is a clean town, with extensive bazaars. Enzeli, the only seaport, has a harbor deep enough for vessels of 250 tons.

GHIRLANDAIO (otherwise called **CORRADI**, or **BIGORDI**), **DOMENICO DEL**, an Italian painter, the master of Michel Angelo, born in Florence in 1451, died there in 1495. His father was a goldsmith, called Ghirlandaio from the silver ornaments in the shape of garlands which he manufactured; and the son, who was brought up to the same calling, inherited the name. Domenico early manifested an extraordinary aptitude for portraiture, and, after studying under Alessio Baldovinetti, went to Rome to assist in the decoration of the Sistine chapel. Of the pictures executed by him there, but one now exists, the "Calling of St. Peter and St. Andrew." Upon returning to Florence he painted a chapel of the Vespucci family in the church of Ognissanti, in one of the compartments of which he introduced a portrait of the navigator, Amerigo Vespucci. Of greater excellence was his series of frescoes in the Sassetti chapel in Santissima Trinità, representing the life of St. Francis. In these works, as in the frescoes in the choir of Sta. Maria Novella depicting the lives of John the Baptist and the Virgin, he introduced excellent portraits of many eminent Florentines of the period. He painted many easel pictures in oil and distemper; but his frescoes, in the coloring of which, as well as in the mechanical and technical parts of his art, he excelled all previous painters, are

incomparably his finest works. He is said to have created aerial perspective, and to have perfected the art of mosaic. Two brothers, Benedetto and Davide, and a son, Ridolfo, were also painters of some distinction.

GHIZEH. See **GIZEH**.

GHUZNI, **Ghizze**, or **Ghazna**, a fortified city of Afghanistan, on the river Ghuzni, 80 m. S. S. W. of Cabool; pop. estimated at from 8,000 to 10,000. It is a commercial entrepot between the Punjab and Cabool. It lies on the W. extremity of a range of low hills, which rises above the plain; and as the plain itself is high, the site is 7,726 ft. above the sea. The fortress is an irregular square, with a circuit of about a mile and a quarter. The wall, which is flanked by numerous towers, has a wet ditch supplied with water from the river Ghuzni, which flows around the W. angle. In the N. part of the enclosed town is the citadel. In former times Ghuzni was a magnificent city, filled with palaces, mosques, fountains, reservoirs, and baths. Two lofty minarets, the smaller of which is more than 100 ft. high, several tombs, and a quantity of ruins scattered over a wide area 3 m. N. E. of the modern town, are the only relics of its former grandeur.—About 970 Alp-Teghin, governor of Khorasan under the king of Bokhara, revolted against his sultan and established at Ghuzni the seat of an independent empire, including Cabool and Candahar. Under Mahmoud, the third prince of this new dynasty, Ghuzni acquired historical importance as the centre of the first permanent Mussulman conquests in India. Mahmoud extended his victories from the Tigris to the Ganges, from the Indian ocean to the Oxus. He made twelve great military expeditions, breaking idols, plundering temples, and rendering his capital one of the richest cities of Asia. He built a mosque of granite and marble, and lavished upon it ornaments of such magnificence that throughout the East it was known as the "celestial bride." He founded and endowed a university, patronized literature, and filled his court with poets and philosophers. After his death (about 1080) Ghuzni declined. In 1152 it was taken by the princes of Ghore. In 1839 it was stormed by the British under Sir J. Keane. In 1842 it surrendered to the Afghans, but was retaken by Gen. Sir William Nott, who brought back to India the famous gates of Somnauth, which Mahmoud had carried off from Guzerat.

GIANT (Gr. *γίγας*, gen. *γίγαντος*, from *γῆ*, the earth, and obsolete *γεννῆναι*, to be born, earth-born), a person of extraordinary stature. The Hebrew word *nephilim* (Gen. vi. 4.), which the Septuagint renders giants (*γίγαντες*), has had a variety of interpretations. Some suppose it to mean men of great size; others, men surpassing in physical or mental strength; and others, apostates from the worship of the true God. But there are other passages in the Old Testament which indicate the existence of men of huge dimensions. The Rephaim, the

Anakim, the Emim, and the Zuzim are described as giants. The sons of Anak were "men of great stature," before whom the children of Israel, as their frightened scouts reported, were "as grasshoppers." Of Og, king of Bashan, and of Goliath, sufficient particulars are given to leave little room for doubt that they were of enormous stature.—The fables of the giants and Titans in classical mythology probably had their origin in terrestrial natural phenomena. The scene of their contests is usually laid in volcanic districts. According to Homer, a race of giants who dwelt in the distant west were destroyed by the gods; Hesiod represented the giants as divine beings, who sprang from the blood of Uranus as it fell on the earth; and by later poets they were described as enemies of Jupiter, who vainly attempted to take Olympus by storm. Scandinavian mythology is peopled with giants (jotuns), who dwelt in forests and caves, amid treasures of gold and silver. They may be a reminiscence of some hostile race of the early times, who had sought refuge in the natural fastnesses of the land. Giants abound in German legends, and may often be traced, like the classical myths, to an origin connected directly with meteorological or terrestrial phenomena. In considering the accounts of giants with which classical literature is filled, it must be borne in mind that all the ancient nations were accustomed to magnify the stature of their kings and heroes. To be thought a giant in strength and in size was the ambition of every warrior. Alexander the Great, in one of his Asian expeditions, caused to be made and left behind him a suit of armor of huge proportions, for the purpose of inducing a belief among the people he had conquered that he was of great stature. Homer exaggerates the size and strength of the heroes of the Trojan war, and declares that the race of man in his day had degenerated in size. More recent writers are not free from similar fictions. King Arthur and his knights and Charlemagne and his paladins were represented to be greater in stature than common men. Roland, the hero of Roncesvalles, was said to be of gigantic size; but when Francis I. opened his tomb and tried on his armor it fitted him, although he was no larger than other men of his age. The body of William the Conqueror, examined 400 years after burial, was currently reported to be eight feet in length; but Stowe says that when his tomb in Caen was broken open in 1562, his bones were found to be not remarkable for size. The Germans and Gauls appeared to the Romans to be of immense stature. Cæsar says: "Our shortness of stature, in comparison with the great size of their bodies, is generally a subject of much contempt to the men of Gaul." Tacitus describes the Germans as of robust form and of great stature; and Strabo says that he had seen Britons at Rome who were half a foot taller than the tallest Italians. Yet there is no proof that the men of

these nations were any larger in ancient times than now; on the contrary, the remains found in graves and barrows are usually under the average height of men of the same races of the present day. It is the same with Egyptian mummies. According to Athenæus, a man of four cubits or six feet in height was considered of "gigantic size" in Egypt. Apollodorus gives the height of the "gigantic Hercules" as four cubits; and Phya, the woman who was selected on account of her great height to personate Minerva at Athens, in the time of Pisistratus, was only about 5 ft. 10 in. Were it possible to get at the truth concerning the accounts of the giants of antiquity, there is little doubt that half of them would prove to be myths, and the greater part of the remainder gross exaggerations. Pliny's assertion that mankind is gradually decreasing in size rests on no good foundation. On the contrary, a vast amount of evidence can be adduced to show that the men of to-day are equal if not superior in stature to the ancients. The size of the armor, weapons, finger rings, and architecture of antiquity, and the measures of length derived from the human form that have come down to us, all go to prove this. But we must not therefore conclude that all the giants of the classical writers are imaginary. The diversity in the height and size of the human family that now prevails has doubtless existed in all ages. Instances are not wanting of individuals of 8 and even 9 ft. in height. Pliny tells of an Arabian giant named Gabbara who was over 9 ft. high, and of two others, Pusia and Secondilla, whose skeletons, 9½ ft. in length, were preserved in the Sallustian gardens. According to Julius Capitolinus, the emperor Maximin exceeded 8 ft. In more modern times we have numerous records of men of gigantic stature. Diemerbroeck says that he saw in Utrecht, in 1665, a man 8½ ft. high, who was born of parents of ordinary stature. Charles Birne, an Irishman, measured 8 ft. 4 in.; he died in 1783, aged 22, and his skeleton, now in the college of surgeons, London, is 8 ft. long. Edmond Malone, also Irish, born in 1682, stood 7 ft. 7 in. with his shoes off; and Patrick Cottar, still another Hibernian, is said to have been 8 ft. 7½ in. high. Walter Parsons, porter to King James I. of England, was 7 ft. 7 in.; and Maximilian Christian Miller, a native of Leipzig, who died in London in 1734, was nearly 8 ft. The brothers Knipe were each about 7 ft. 2 in.; and M. Louis, a Frenchman, was 7 ft. 6 in.; the latter had two sisters nearly as tall as himself, and a brother who was still taller. Miles Darden, of Tennessee, was 7 ft. 6 in. (See DARDEN.) Buffon gives a number of well authenticated cases in which men have reached an extraordinary height. The giant of Thoresby, England, was 7 ft. 5 in.; a porter of the duke of Württemberg was 7½ ft.; Cajanus, of Finland, was 8 ft., as was also a Swedish peasant. One of the guards of the duke of Bruns-

wick measured $8\frac{1}{2}$ ft.; Gilli, a giant of Trent, in Tyrol, was 8 ft. 2 in.; and a Swede in the celebrated grenadier guard of Frederick William I. of Prussia stood $8\frac{1}{2}$ ft.—There is probably not a single well authenticated case, among the many given by ancient writers, of men whose stature has exceeded the natural limits, that has not been equalled in a comparatively modern period. Giants fully 8 ft. high are not unfrequently exhibited. The enormous skeletons, found in times past, of 20, 30, 50, and 100 ft. in length, were without doubt the fossil remains of animals of the primitive world, which only ignorance could have ascribed to a human origin. The progress of comparative anatomy has aided to dispel the errors long prevalent in relation to giants, and there is little fear that men of science of the present age will be deceived, as Buffon was, into representing as human the bones of an elephant.

* **GIANTS' CAUSEWAY**, a series of columnar basaltic rocks in the county Antrim, on the N. E. coast of Ireland, between Bengore Head and

Port Rush. For 8 m. along the coast, from Bengore to Fairhead, the land abuts upon the sea in cliffs of basalt, many of which are made up in great part of rude vertical columns which alternate with layers of amorphous beds of the same class of rock. Ranges of these piled upon each other sometimes reach the height of 400 and at Fairhead even 550 ft. As seen from the sea in front, the uniformity of the arrangement of vertical columns and horizontal beds suggests rude resemblances to architectural forms. At the base of the cliffs is a talus of ruins that have fallen from the structures above and slope down to the water. But though the name of Giants' Causeway is often applied to all this coast range, it is properly applicable to but a small portion of it, a locality quite unpretending in its extent or in the grandeur of its features. It is a platform of basalt, composed of closely arranged columns, ranging from 15 to 36 ft. in height. This platform extends from a steep cliff down into the sea, till it is lost below low-water mark. Its

Giants' Causeway.

length exposed at low water is differently given, but probably is less than 800 ft. It is divided across its breadth into three portions, which are called the Little, the Middle, and the Large or Grand Causeway; the first being that on the east. These are separated from each other by dikes of amorphous basalt. The Great Causeway, which is the principal object of interest, is only from 20 to 30 ft. wide, though detached outliers of the same columnar structure standing on the shore near by might be added to increase the width. They no doubt connect with the same group below the surface. The columns are for the most part hexagonal prisms; but they are found also of five, seven, eight, and nine sides, and in one instance

at least of three sides. They are all jointed into short irregular lengths from a few inches to a few feet each, the articulations being perfectly fitted by a convex end entering the concavity of the adjoining piece, so that the blocks form a true column. There is no uniformity in the arrangement of the convexities and concavities, but generally the upper part of this section is concave. The diameter is variable, but ranges generally from 15 to 28 in. The columns fit together with the utmost precision, the corresponding faces of adjacent prisms being always equal, and so continuing from the top of the platform till the lines of separation are lost beneath the ground. It is said that water even cannot penetrate between adjoin-

ing columns. This portion is about 100 yards in length, extending from high-water mark to within 20 ft. of the cliff. The other portions are more uneven, and the columns in them are not uniformly vertical, but slope outward along the sides. The name causeway is given to the group from the circumstance of the columns terminating at a nearly uniform height, and thus presenting a tolerably smooth area gently inclining to the water. The columns of basalt do not retain their articulated character throughout the cliffs. At Fairhead they rise in single pieces, and, as measured by the officers of the ordnance trigonometrical survey of Ireland, some are found to stand 817 ft. in height, with sides occasionally of 5 ft. in breadth. These are flat at their extremities. The formation is intersected by narrow dikes of columnar basalt, in which the prisms are piled horizontally, ranging across the line of the dikes. (See BASALT.) In this region it appears to have been protruded after the period of the deposition of the lias and chalk, the strata of these formations being penetrated by its dikes and overlaid by its horizontal beds.

GIAOUR, a term of insult applied by the Turks to all unbelievers in Mohammedanism, and especially to Christians. The sultan Mahmoud II. forbade his subjects to apply it to any European Christian. It is a corruption of the Arabic *kiafir*, and is equivalent to "heathen," "pagan," or "infidel."

GIBBON (*hylobates*), a genus of apes, sometimes called wood-walkers from their astonishing agility in swinging from tree to tree. They seem to form a connecting link between the

to the ground, and when extended are twice the length of the body. The white-handed gibbon (*H. lar*) varies in color from black to brown, the hands being much lighter; it is an inhabitant of Malacca and Siam. The agile gibbon (*H. agilis*) and the silvery gibbon (*H. leuciscus*), of the same countries, are nearly allied species, or perhaps mere varieties. The gibbons are the most active of the quadrumana in the trees, but very awkward on the ground; very shy in their native haunts, in captivity they are the most docile and gentle of the apes; they generally live in pairs. One variety is sometimes called hoolock.

GIBBON, Edward, an English historian, born in Putney, April 27, 1737, died in London, Jan. 16, 1794. He was the eldest of a family of six sons and a daughter, all the rest of whom died in infancy, and he was so feeble in his youth that he seemed likely to share their fate. At the age of seven a domestic tutor, John Kirby, taught him the elements of Latin. In his ninth year, during "a lucid interval of health," as he says in his "Memoirs," he was sent to the grammar school of Kingston-upon-Thames, where he remained two years. His mother having died in 1747, he removed with his father and aunt to Buriton, Hampshire, where he began to read voluminously. In January, 1749, his aunt opened a boarding house for Westminster scholars, and Gibbon enjoyed her care while he attended the school, but, owing to delicate health, learned little. In his 16th year his health improved, a sudden change took place in his constitution, his mind seemed to gain new activity, and he read assiduously, chiefly on historical subjects. In 1752 he went to Oxford, and, neglected by his tutor, gave himself to general reading. He was then fond of oriental research, and bought the *Bibliothèque orientale* of D'Herbelot with his spare money. He began to write a treatise on the "Age of Sesostris," which was probably a crude effort, for he burned it 20 years afterward. He busied himself also with religious investigation, and having read Bossuet's "Variations of Protestantism" and "Exposition of Catholic Doctrine," as well as other controversial writings, became a Roman Catholic. He went from Oxford to London, and there, before a Catholic priest, abjured Protestantism, and announced his act to his father in a long letter. The father revealed the secret, and Gibbon was expelled from Oxford, after a residence there of 14 months. He was next consigned to Switzerland in a kind of exile, and placed under the care of M. Pavillard, a Calvinistic minister at Lausanne, who it was hoped would reconvert him. He lived in a plain manner in M. Pavillard's house, and at first lamented the loss of English luxury. But soon his passion for study revived; he read systematically the Latin, Greek, and French classics, Croussaz, Locke, and Grotius, and was especially delighted with the "Provincial Letters" of Pascal, from which he learned "to manage the weapon

Gibbon (*Hylobates*).

apes and the baboons, having in a small degree the posterior callosities of the latter. The arms are of enormous length, the chest capacious, the legs short, the hair soft, and the voice very loud. They rarely exceed 4 ft. in height, and many are under 3; the arms reach

of grave and temperate irony, even on subjects of ecclesiastical solemnity." During the five years of his exile he made the French language more familiar to him than the English. He returned to Protestantism on Christmas, 1754, 18 months after his conversion to Catholicism, and from that time he cared little for theological differences. At Lausanne he formed an attachment for Susanne Curchod, the daughter of a Swiss pastor; but his father disapproving of the connection, Gibbon philosophically resigned the object of his love, who afterward became the wife of the banker Necker. "I sighed," he says, "as a lover, but obeyed as a son." He returned to England in the summer of 1758, and passed two years chiefly in study at the family seat, Buriton, during which he accomplished a course of classical reading equalled by few of his contemporaries. After residing several months in London, he joined with his father the Hampshire militia, and for more than two years studied practically the military art. Even in the camp he found time for books, and meditated a number of great literary projects. In 1761 he published his *Essai sur l'étude de la littérature*, which he had commenced at Lausanne, designed to defend classical studies against the attacks of the French philosophers. The essay was commended by foreign critics, though scarcely noticed in England. He travelled in 1763, and on his way to Lausanne spent three months in Paris. His essay had given him some renown, and he frequently met D'Alembert, Diderot, Baron d'Holbach, and the other philosophers. After remaining at Lausanne nearly a year, he passed in 1764 into Italy. As he approached Rome he occupied his mind with its antiquities and topography. He read Nardini, Donati, Cluverius; he filled his commonplace books with copious extracts, and stored his memory with abundant learning before he ventured to cross the forum or ascend the Capitoline hill. "It was at Rome," he writes, "on the 15th of October, 1764, as I sat musing amid the ruins of the capitol, while barefooted friars were singing vespers in the temple of Jupiter, that the idea of writing the decline and fall of the city first started to my mind. But my original plan was circumscribed to the decay of the city, rather than of the empire; and though my reading and reflections began to point toward that object, some years elapsed, and several avocations intervened, before I was seriously engaged in the execution of that laborious task." He went south to Naples, returned to Paris, and reached his father's house in June, 1765. At Lausanne in his earlier visits he had formed an intimacy with M. Deyverdun, a young Swiss of fine scholarship, who now visited him yearly at Buriton. With his aid Gibbon began writing a history of the liberty of the Swiss. After two years of study and preparation, the first book, which was written in French, was read as an anonymous production before a literary club of foreigners in London,

by whom it was at once condemned, and the work went no further. He next, in connection with Deyverdun, started the *Mémoires littéraires de la Grande Bretagne*. It was designed to be annual, but two volumes only were printed (1767-'8), when Deyverdun went abroad. His next work was an anonymous and acrimonious attack on that portion of Warburton's "Divine Legation of Moses" in which the 6th book of the *Æneid* is represented as containing an allegorical account of the initiation of *Æneas* in the character of a lawgiver into the Eleusinian mysteries. Though Warburton was the ruling critic of the time, Gibbon's "Critical Observations" (1770) were admitted to have overthrown his hypothesis. The subject was one that could have but little general interest, but the unknown author was mentioned by Heyne of Göttingen as a *doctus et elegantissimus Britannus*. His father having died in November, 1770, Gibbon settled in London, and, with a considerable though somewhat embarrassed estate, lived in studious ease, and began to labor more directly upon his "Decline and Fall," which he had been wont to "contemplate at awful distance." In 1774 he entered the house of commons as member for the borough of Liskeard, and held the seat for eight years a silent supporter of the measures of Lord North. Such was his timidity that he was never able to address the house; more than once he prepared himself to speak, but when the moment for action came his courage wholly deserted him. Near the close of 1775 the first volume of his history was completed. It was refused by the bookseller Elmsley, but accepted by Cadell and Strahan. It appeared in February, 1776; its success was immediate, and, for a quarto and a grave historical production, unprecedented. The first edition was exhausted in a few days; a second and third were soon called for. Hume and Robertson, to whom he sent copies, wrote him congratulatory letters. His splendid theme and imposing style fixed the attention of the public, while his views of Christianity in the last two chapters called forth numerous replies. Watson, Taylor, Milner, Lord Hailes, Davies of Oxford, and Dr. Priestley were the most noted of his assailants; but to Davies alone would the historian consent to reply, because this critic had questioned not his faith, but his historical fidelity. His "Vindication" soon appeared, in which he freed himself from the charge of misquotation. Meantime he studied chemistry and anatomy for recreation. He wrote a political pamphlet in French, in defence of the ministry, and was rewarded with a sinecure place in the board of trade worth £800 a year. He was a member of the Literary club, and a noted conversationist. The second and third volumes of his history were published in 1781, and were received with avidity. On the fall of Lord North's ministry and the loss of his salary by the abolition of the board of trade, Gibbon thought himself too poor to live in England, and went to Lausanne in

1788 to reside with his friend Deyverdun. His fourth volume, embracing the reign of Justinian and the chapter on the Institutes, was already finished, but on the borders of the lake of Geneva he allowed nearly a year to pass before he vigorously resumed his work. He was fond of society, and became highly popular among the Swiss; he gave balls and suppers, frequented assemblies, received many eminent visitors, and even after he was fairly reseat at his task mingled gayety with constant study. He wrote steadily and rapidly till he completed his work, June 27, 1787. He went to England bearing the manuscript of the last three volumes with him, and on his 51st birthday, the period selected by himself, they were issued. The work was already established in fame; it was translated into German, French, and Italian. His profit from all the volumes is stated to have been £6,000, and that of the booksellers £80,000. The later volumes were reproached for indecencies, veiled for the most part in the learned languages in the notes. Gibbon returned to Lausanne in July, 1788, to find his friend Deyverdun dying. He now wrote his own "Memoirs," which were published posthumously. The French revolution disturbed his repose. Lausanne was filled with French emigrants; the Neckers with their daughter, afterward Mme. de Staël, were his neighbors at Coppet. Lady Sheffield, the wife of his intimate friend Lord Sheffield, died about this time, and Gibbon, partly in the hope of consoling his friend, partly in fear of the revolution, set out for England in the spring of 1793. He had long suffered from hydrocele, which he had studiously concealed, and he died calmly after undergoing three painful operations. He was buried in Lord Sheffield's family burial place at Fletching, in Sussex, and his epitaph was written by Dr. Parr.—In appearance Gibbon was heavy and dull, his countenance showed no trace of intellect, and his features were unattractive. He was fond of fine dress, and his manners were well bred but pompous. He conversed with fluency in sounding language and well ordered periods. His "Decline and Fall of the Roman Empire" is admitted to be the greatest historical work in the English language, and one of the greatest creations of any single intellect. It is hardly less than the history of the world for nearly 13 centuries, for it comprises an account of all the nations who influenced the destinies of the Roman empire both in the West and East. Its vast design, including the decay and ruin of an ancient civilization and the birth and formation of a new order of things; its lucid arrangement, subordinating an infinite variety of subjects to one main and predominant idea, tracing the progress of hostile religions, the influx of successive hosts of barbarians from remote and opposite quarters, the development of the Roman law, the details of ecclesiastical history, and the general rise of modern states, according to the impressions

which they made on the tottering fabric of Roman greatness; its singular condensation of matter, general accuracy, and splendid, imposing, and picturesque style, are among the qualities which secure its eminence in historical literature. "Christianity alone," says Milman, "receives no embellishment from the magic of Gibbon's language; his imagination is dead to its moral dignity; it is kept down by a general tone of jealous disparagement, or neutralized by a painfully elaborate exposition of its darker and degenerate periods." The best editions are those edited by the Rev. H. H. Milman (12 vols., London, 1888-'9; 2d ed., 1845), which embodies notes by the editor, and by Guizot and others, and that by William Smith (8 vols., 1854-'5), containing many new notes. Dr. Smith's abridgment, "The Student's Gibbon," is valuable as a concise summary of the work. Gibbon's memoirs and miscellaneous writings were published under the care of Lord Sheffield (2 vols., London, 1796, to which a third volume was added in 1815).

GIBBONS, Grinling, an English wood carver and sculptor, born about 1650, died in London, Aug. 8, 1721. He was the son of a Dutchman who settled in London; and as he early excelled in his art, Evelyn recommended him to Charles II., who attached him to the board of public works, and employed him in the chapel of Windsor castle, for which he carved the foliage, and in the choir of St. Paul's and the great room at Petworth, the decorations of the latter being regarded as his masterpiece. Among his other carvings are the font in St. James's, Piccadilly, and the base of the equestrian statue of Charles I., in Charing cross. His best known sculpture is the statue of James II. in front of Whitehall. His fame, however, rests mainly on his wood carving, in which his touch was so graceful and delicate that his carved feathers can hardly be distinguished from real ones.

GIBBONS, Orlando, an English composer, born in Cambridge in 1583, died in 1625. At the age of 21 he was made organist of the royal chapel. In 1622 the degree of doctor of music was conferred on him by the university of Oxford. He was principally distinguished for his church music, his anthems being regarded in their day as model compositions of that class. He was also a skilful composer of madrigals.

GIBBS, Josiah Willard, an American philologist, born in Salem, Mass., April 30, 1790, died in New Haven, March 25, 1861. He graduated at Yale college in 1809, and was tutor in that institution from 1811 to 1815. In 1824 he was appointed professor of sacred literature in the theological department of Yale college, a post which he held until his death. In his special department, and in philological and grammatical studies generally, he was a thorough and accurate scholar. His principal publications are: a translation of Storr's "Essay on the Historical Sense of the New Testament" (Boston, 1817); translation of Gesenius's "Hebrew

Lexicon of the Old Testament" (Andover, 1824); "Manual Hebrew and English Lexicon," abridged from Gesenius (Andover, 1828); "Philological Studies" (New Haven, 1857); and "Latin Analyst" (New Haven, 1858). He contributed also to several important philological works, including the revised edition of Webster's dictionary and W. C. Fowler's work on the English language; and furnished valuable papers to the "American Journal of Science" and other critical periodicals.

GIBBS, Welcott, an American chemist, born in New York, Feb. 21, 1822. He graduated at Columbia college in 1841, and studied chemistry under Prof. Hare at Philadelphia, and medicine at the New York college of physicians and surgeons, taking his degree in 1844. He then went to Europe, and studied under Liebig and Rammelsberg. On his return, in 1849, he was elected professor of chemistry and physics in the New York free academy. In 1863 he became professor in Harvard university, and lecturer on the application of science to the useful arts, which chair he still occupies. He was a member of the United States sanitary commission during the civil war, and was appointed by President Grant scientific commissioner to the Vienna exhibition in 1873. His writings relate exclusively to chemical and physical subjects. He has published about 50 papers, mainly in the "American Journal of Science."

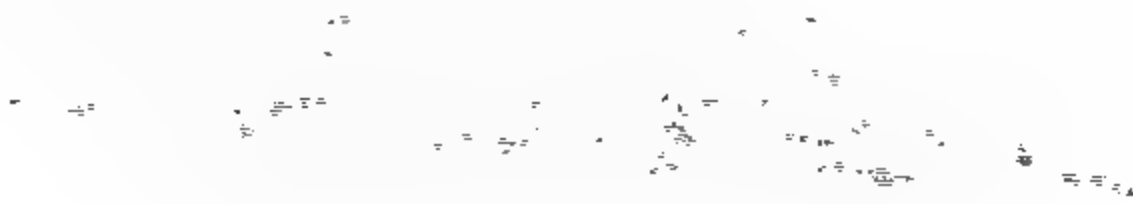
GIBEON (Heb., hill city), one of the principal cities of Palestine, about 5 m. N. W. of Jerusalem. Before the conquest of Canaan by Joshua, it was inhabited by Hivites, who by stratagem secured their own safety and protection from Israel; though when the deception was discovered the Gibeonites were degraded to the condition of hereditary "hewers of wood and drawers of water unto all the congregation." It is not mentioned as one of the royal cities of the Canaanites, though described as a great city, and as one of the royal cities. When the five kings of the Amorites besieged Gibeon because of its having made peace with Israel, Joshua marched against them, and at his command, as we are told after the poetical book of Jasher, "the sun stood still, and the moon stayed, until the people had avenged themselves upon their enemies" (Josh. x. 1-14). The Gibeonites were persecuted and nearly exterminated by Saul. On the division of Canaan, Gibeon fell to the tribe of Benjamin; afterward it was given to the Levites; toward the close of David's and in the beginning of Solomon's reign, the sanctuary was there, and there dwelt the high priest. Near to it was a pool, probably the "great waters" referred to by Jeremiah, where Abner was defeated by Joab, and also a great stone, or monumental pillar. It is identified with the modern El-Jib, an irregular village, seated on the summit of a hill, and containing massive ruins.

GIBRALTAR (Arab. *Jebel al-Tarik*, mount of Tarik), a fortified rock on the S. coast of An-

dalusia, Spain, belonging to Great Britain, and giving name to a town and bay on its W. side, and to the strait connecting the Atlantic and the Mediterranean. Europa point, its S. extremity, is in lat. 36° 6' N., lon. 5° 21' W. The rock forms a promontory, 3 m. long from N. to S. and about 7 m. in circumference. A low sandy isthmus, 1½ m. long and ¼ m. broad, connects it with the mainland of Spain, having the bay of Gibraltar on the west and the Mediterranean on the east. Two parallel rows of sentry boxes across this flat mark the Spanish and English lines, the space between them being called the "neutral ground." The N., E., and S. sides of the rock are steep and precipitous, and almost inaccessible. On the west it slopes down to the water; here are the town and the principal fortifications. The highest point is about 1,400 ft. above the sea. The rock is composed of gray primary limestone and marble, and was uplifted probably at a recent geologic period, as a marine beach exists more than 450 ft. above the sea. It is perforated by a number of remarkable natural caverns, all of which are difficult of access. The largest, called St. Michael's, has a hall hung with stalactites reaching from roof to floor. Its entrance is 1,000 ft. above the sea, and it is connected with other caverns beneath it of unknown depth. From the sea the surface appears barren; but acacia, fig, and orange trees, and a variety of odoriferous plants, grow in sheltered places. The animal productions are a few kinds of birds, wild rabbits, snakes, and monkeys. The latter, the only wild monkeys in Europe, are of a fawn color and without tails. The climate is temperate and generally healthy, but about once in 12 years an endemic fever, known as the Gibraltar fever, prevails. Immense sums of money and a vast amount of labor have been expended on the fortifications of this stronghold. The most remarkable of the works are the galleries tunnelled in tiers through the solid rock, along the N. front. They are 2 or 3 m. long, and are wide enough to admit a carriage. At every 12 yards they are pierced with ports for guns, so as to command the bay and neutral ground. On the summit of the rock are barracks and fortresses, and strong batteries frown all along the slope on the W. side. More than 1,000 guns are now in position. The garrison consisted in 1872 of 4,308 men. The cost of maintaining the fortress in 1867-'8 was £420,465; estimate for 1872-'3, £219,417.—The town of Gibraltar lies on a shelving ledge on the W. side of the rock, near its N. extremity, 65 m. S. E. of Cadiz; pop. in 1871 (exclusive of the garrison), 16,454, English, Spaniards, Jews, and Moors. It consists chiefly of one spacious street, called the Main or Waterport street, about ¼ m. long and well paved and lighted. The town appears to be more populous than it really is, from the number of strangers visiting it. Great care is taken to prevent the increase of new residents, and

foreigners are allowed to remain only during specified periods, and on giving security for good behavior. The principal buildings are the residences of the governor and lieutenant governor, the admiralty, naval hospital, barracks, and storehouses. There are also Protestant and Roman Catholic churches, four Jewish synagogues, seven regimental and two public schools, a theatre, several hotels, a lunatic asylum, and an almshouse. The garrison library, founded in 1793, contains upward of 20,000 volumes. The water used in the town and by the garrison is collected entirely from the roofs in the rainy season and kept in tanks under the houses. Although a free port, Gibraltar has but little trade. British manufactures for the Barbary states and for other countries bordering on the Mediterranean are distributed through it to some extent. The

chief imports are cotton and woollen goods from England; tobacco, rice, and flour from the United States; sugar and rum from the West Indies; and wines, silks, spices, tea, and wax from the East. The chief export is wine. The revenues are usually about £30,000, and the expenditures nearly the same. The entire administration of affairs is in the hands of the military governor.—The bay of Gibraltar, sometimes called Algeciras bay, is formed by the promontory of Gibraltar on the east and the mainland terminating in Point St. Garcia on the west. It is $4\frac{1}{2}$ m. wide from E. to W., and about 6 m. long from N. to S. Its depth of water, which is 260 ft. at the entrance, gradually diminishes toward the head of the bay, affording good anchorage. The tide rises 4 or 5 ft. Several small streams empty into it on the west and north. Opposite Gibraltar,



Gibraltar.

on the W. side, is the Spanish town of Algeciras. On the British side shipping is protected by two long moles.—The strait of Gibraltar, the channel connecting the Atlantic and the Mediterranean, lies between the southernmost part of Spain, from Cape Europa to Cape Trafalgar, and the African coast opposite, from Ceuta point on the east to Cape Spartel on the west. Its length from E. to W. is about 36 m. The narrowest point is S. of Tarifa, where the opposite coasts are but 9 m. apart. From Europa to Ceuta point is about 15 m., and from Trafalgar to Spartel about 25. The greatest depth of water is 960 fathoms. Through the strait a strong central current, from 3 to 6 m. an hour, sets constantly from the Atlantic into the Mediterranean; and two smaller currents, one along each coast, ebb and flow with the tide, running alternately into the Atlantic and the Mediterranean. The excess of water thus

flowing into the latter sea is necessary to supply the loss by evaporation.—The rock of Gibraltar, though well known to the ancients, was not occupied until a comparatively modern period. By the Phœnicians it was called Alube, which the Greeks corrupted into Calpe. Ceuta, the African point opposite, called by the English Ape's hill, was the ancient Abyla. These two hills constituted the pillars of Hercules, named, not from the Greek hero, but from the Tyrian deity, whose worship the Phœnicians introduced into all their settlements. The strait was long regarded as the western boundary of the world. The value of Gibraltar as a strategic point was first discovered by the Saracens, who, under their leader Tarik (or Tarif) ben Zeyad, landed there in April, 711. In the following year Tarik built a fortification on the height, and it was called thenceforward after his name. In 725

was erected the castle which is still standing at the N. end of the rock. The fortifications were further strengthened in 1161 under the direction of Alhaug Yaix, a celebrated Moorish engineer. In 1309 the place was captured by the Christians under Guzman the Good, and recaptured by the Moors in 1333. In 1349 siege was laid to it again by Alfonso XI. of Castile, but raised in the following year on account of the plague, which carried off the king. Gibraltar was finally captured by the Christians under the duke of Medina Sidonia in 1462. Under the Spanish crown it was so strengthened as to be considered impregnable; but it was taken Aug. 4, 1704, by a combined English and Dutch fleet under Sir George Rooke and the prince of Hesse-Darmstadt, and held till 1713, when it was confirmed to Great Britain by the treaty of Utrecht. Early in 1727 the Spaniards attacked it with a large force, but raised the siege on the signing of preliminaries of a peace with Great Britain in May of the same year. But the most memorable siege of Gibraltar was that of 1779-'83, sustained against the combined land and naval forces of France and Spain. By June 21, 1779, all communication between the rock and the mainland was cut off, and in July the fortress was completely blockaded. The cannonading began in September on the part of the besieged, but the Spaniards did not open their fire until January, 1780. The attack and defence which followed fixed the attention of Europe for the next three years. On the part of the besiegers all the resources of war were brought to bear both by land and sea. The best engineers of France and Spain directed the approaches; a powerful fleet anchored in the bay, and for three weeks an incessant bombardment was kept up from 80 mortars and 200 pieces of battering cannon. The garrison, commanded by Sir Gilbert Elliott (afterward Lord Heathfield), and numbering 7,000 men, made a heroic resistance. On Nov. 27, 1781, they destroyed the enemies' works in a sortie, but the allies at once reconstructed them, and soon brought 1,000 pieces of artillery to play against the fortress, while 47 ships of the line and innumerable smaller vessels menaced it by sea, and an army of 40,000 men conducted the operations on land. The whole enterprise was directed by the duke de Crillon. Meanwhile Admiral Rodney, having defeated the fleet of Count de Grasse, succeeded in throwing relief into the fort. In September, 1782, the allies attempted to silence the British fire by means of 10 enormous floating batteries constructed by the chevalier d'Arçon in such a manner as to be deemed invulnerable. Each was manned by a picked crew and mounted from 6 to 21 guns. On the 13th they were put in motion, and one of the most dreadful cannonadings known in history was opened on both sides. It continued for several hours with little advantage to either party, but late in the afternoon the effect of the red-hot shot from the

garrison became apparent, and soon after midnight nine of the batteries were on fire. Of their crews about 400 men were saved by the exertions of the British; the rest perished by the flames, explosions, or drowning. The besieged had 16 killed and 68 wounded. Several attempts to storm the rock by land proved equally disastrous. The British received fresh reinforcements, and in February, 1783, the siege was raised on the signing of preliminaries of peace. In 1868 a proposal to surrender Gibraltar to Spain was agitated in England, but did not meet with public favor. As the key to the Mediterranean and one of the chain of fortresses connecting Great Britain with her East Indian possessions, it is of incalculable value for a coaling station, a depot for war material, and a port of refuge.

GIBSON. I. A W. county of Tennessee, drained by Forked Deer and Obion rivers; area, 520 sq. m.; pop. in 1870, 25,666, of whom 6,856 were colored. The surface is generally even and the soil fertile. The Mobile and Ohio and the Memphis and Louisville railroads pass through it. The chief productions in 1870 were 116,869 bushels of wheat, 106,775 of Indian corn, 16,319 of peas and beans, 23,440 of Irish and 60,275 of sweet potatoes, 243,746 lbs. of butter, 879 tons of hay, and 9,815 bales of cotton. There were 5,631 horses, 2,955 mules and asses, 5,470 milch cows, 6,883 other cattle, 14,113 sheep, and 53,103 swine; 6 manufactories of agricultural implements, 10 of bricks, 13 of carriages, 5 of furniture, 3 of iron castings, 1 of kindling wood, 7 of saddlery and harness, 1 of sashes, doors, and blinds, 6 wool carding and cloth dressing establishments, 11 flour mills, 1 planing mill, and 15 saw mills. Capital, Trenton. II. A S. W. county of Indiana, bordering on Illinois, area, 449 sq. m.; pop. in 1870, 17,571. It contains coal, and has an undulating surface and a rich soil, watered by the Wabash and Patoka rivers, the former of which forms the W. boundary. The Wabash and Erie canal and the Evansville and Crawfordsville railroad intersect it. The chief productions in 1870 were 457,260 bushels of wheat, 757,933 of Indian corn, 39,807 of oats, 22,979 of potatoes, 102,812 lbs. of butter, 37,440 of wool, 182,031 of tobacco, and 7,564 tons of hay. There were 5,206 horses, 8,795 milch cows, 6,026 other cattle, 15,038 sheep, and 28,222 swine; 11 manufactories of carriages, 1 of furniture, 9 of saddlery and harness, 4 of woollen goods, 3 distilleries, 12 flour mills, and 6 saw mills. Capital, Princeton.

GIBSON, John, an English sculptor, born at Conway, North Wales, in 1791, died in Rome, Jan. 27, 1866. His father, who was a market gardener, removed to Liverpool, and young Gibson, after endeavoring to prevail on his parents to allow him to study painting, was apprenticed at the age of 14 to a cabinet maker, and soon after to a wood carver. He attracted the attention of Messrs. Francis, marble cutters, who purchased his indentures and

took him into their employment. Through one of the partners in this firm he was introduced to William Roscoe, the historian, who encouraged him to pursue the career of a sculptor, and was instrumental in raising a fund in Liverpool to enable him to study in Italy. In 1817 he went to Rome, with letters from Flaxman to Canova, who received him as a pupil and gave him all the assistance in his power. In 1821 he produced his first important work, a group of "Mars and Cupid," now at Chatsworth. On the death of Canova in 1822, Gibson studied for a short time with Thorwaldsen. In 1827 he sent his "Psyche and the Zephyrs" to the exhibition of the royal academy, of which he was elected an associate in 1838, and a member in 1836. Most of his works are portrait statues, and ideal pieces founded on classic models. Of the former, the best known are his statues of Queen Victoria in Buckingham palace, at Osborne, and in the new palace at Westminster, those of Huskisson in Liverpool, and of Sir Robert Peel and George Stephenson. His ideal figures and bass reliefs are imbued with the spirit of Greek art. Refinement of feeling, high poetical imagination, exceeding gracefulness of form and expression, and an almost unrivalled delicacy of execution characterize this class of his sculptures. He was the first of modern sculptors who had the daring to introduce color into their works. In some of the subordinate details the statue of the queen and the Aurora were slightly tinted, but the Venus, which attracted much attention at the international exhibition in 1862, showed the innovation carried to its furthest limit. This statue is entirely colored of a flesh tint, and the eyes, hair, and parts of the drapery counterfeit the resemblance to actual life as nearly as color can do it. Gibson also adhered to the practice of habiting his modern figures in classic costume. With the exception of a few short visits to England, he lived almost uninterruptedly in Rome.—See "Life of John Gibson," edited by Lady Eastlake (1869).

GIDDINGS, Joshua Reed, an American statesman, born at Athens, Pa., Oct. 6, 1795, died in Montreal, May 27, 1864. In his infancy his parents removed to Canandaigua, N. Y., where they remained till he was 10 years old, when they emigrated to Ashtabula co., Ohio, among the first settlers in that part of the Western Reserve. In 1812 he enlisted as a soldier, and was one of the expedition sent to the peninsula north of Sandusky bay, where, in two battles on one day with a superior force of Indians, it lost nearly one fifth of its number in killed and wounded. At the close of his term of service he commenced school teaching, and in 1817 began the study of the law, and was admitted to the bar in 1820. In 1826 he was chosen a representative to the state legislature, and in 1838 was elected to congress, where he became at once a prominent champion of the abolition of slavery and the slave trade in the District of Columbia and the territories under

the jurisdiction of the national government. On Feb. 9, 1841, he delivered his first anti-slavery speech, upon the Indian war in Florida, which he contended was begun and carried on in the interest of slavery. In 1842 he brought before congress a series of resolutions in relation to the slaves on the Creole, who had captured that vessel on her passage from Virginia to New Orleans, and carried her into Nassau, where their right to freedom was recognized by the British authorities. His resolutions justified the conduct of the slaves on the ground of their abstract right to freedom, and declared that they had violated no law of the United States, and that any attempt to reenslave them was unauthorized by the constitution and incompatible with the national honor. The great excitement which they caused induced him to withdraw them, but he was nevertheless censured by a congressional vote of 125 to 69, and resigned. He was reelected by a large majority, and resumed his seat after an absence of but six weeks. He was returned by successive reelections until March 4, 1859, making his period of service 20 years, during which he continued upon every opportunity (acting in conjunction with John Quincy Adams till his death) to advocate his views on slavery, while attending closely to the general business of legislation. He acted generally with the whig party till 1848, giving his hearty support to Gen. Harrison and Henry Clay, but refused on anti-slavery grounds to support Gen. Taylor. In the election of 1848 he acted with the free-soil party. In 1850 he took a prominent part in opposing the enactment of the "compromise measures," especially the fugitive slave law. He was conspicuous also in the debates upon the repeal of the Missouri compromise, and in those upon the subsequent troubles in Kansas. On May 8, 1856, while addressing the house, he suddenly fell to the floor in a state of unconsciousness, from which he soon revived, though in a condition of great weakness. On Jan. 17, 1858, he fell again in the same way, and for some minutes was supposed to be dead. He slowly returned to consciousness, but was compelled for a time to be absent from his post. His disease was an affection of the nervous system operating upon the heart. In 1861 he was appointed consul general for the British North American provinces, a position which he held until his death. In 1843 Mr. Giddings wrote a series of political essays, signed "Pacificus," which attracted considerable attention. A volume of his speeches was published in 1853. He also wrote "The Exiles of Florida" (Columbus, 1858), and "The Rebellion, its Authors and Causes" (New York, 1864).

GIDEON, surnamed **Jerubbaal**, the fifth judge in Israel, was the son of Joash, of the tribe of Manasseh, and dwelt at Ophrah. His history is narrated in Judges vi.-ix. Israel had been for seven years humbled by the Midianites and Amalekites, when Gideon by a double miracle was roused to become their deliverer. When

he had fulfilled his mission, the Israelites solicited him to become their king, but he declined, and held for 40 years the office of judge.

GIEN, a town of France, in the department of Loiret, on the right bank of the Loire, crossed here by a fine stone bridge of 12 arches, 38 m. S. E. of Orleans; pop. in 1866, 6,717. It is built on a hill, and has an ancient castle, now used for public offices. The lower part of the town is often overflowed by the rising of the Loire. Pottery, leather, and fine carriages are manufactured, and there is a trade in wine, wool, saffron, coal, &c. Gien is first mentioned at the close of the 8th century as the site of a castle built by Charlemagne. The castle was restored and enlarged in 1494 by Anne of Beaujeu, daughter of Louis XI.

GIESBRECHT, Friedrich Wilhelm Benjamin von, a German historian, born in Berlin, March 5, 1814. His father, Karl Heinrich Ludwig, was a dramatist, and his uncle, Heinrich Ludwig Theodor, was a poet and historian. He studied under Ranke, and became a professor at the gymnasium of Berlin, in 1857 at the university of Königsberg, and in 1862 at that of Munich, where he also presides over the historical seminary, and succeeded Sybel as permanent secretary of the historical committee. He wrote the history of the emperor Otho II. for Ranke's *Jahrbücher des deutschen Reichs* (Berlin, 1840); and having discovered and published the *Annales Altahenses*, a long missing manuscript of the 11th century, the Prussian government enabled him to reside from 1843 to 1845 in Italy to collect original materials for his most important work, *Geschichte der deutschen Kaiserzeit* (8 vols., Brunswick, 1868-'75; 8d ed., 1868). In 1874 he undertook a revised edition and continuation of Heeren and Ukert's *Europäischen Staatengeschichte* (72 vols., Gotha, 1823-'74 et seq.).

GISELER, Johann Karl Ludwig, a German church historian, born at Petershagen, March 8, 1792, died in Göttingen, July 8, 1854. He interrupted his studies in the university of Halle to serve as a volunteer in the campaign of 1813. In 1815 he resumed his studies, which he combined with teaching. In 1818 appeared his *Historisch-kritischer Versuch über die Entstehung und die frühern Schicksale der schriftlichen Evangelien*, and in 1819 he was appointed professor of theology in the university of Bonn, and in 1831 at Göttingen. His principal work is *Lehrbuch der Kirchengeschichte*. The five volumes published during his lifetime brought the history down only to the peace of Westphalia in 1648; but from the notes and manuscripts which he left, it was continued to the present century by his pupil Redepenning. An English translation of the entire work has been published under the editorial care of Prof. Henry B. Smith (4 vols., New York, 1856-'8). It is especially valuable for the fulness of its citations, the source for each important statement being given at length in notes, which in volume far exceed the text.

GIESSEN, a town of Germany, capital of the province of Upper Hesse, in the grand duchy of Hesse-Darmstadt, situated at the confluence of the Wieseck with the Lahn, 30 m. N. of Frankfurt; pop. in 1871, 12,245. It was originally fortified, but its ramparts have been levelled and converted into promenades. The town is well though irregularly built, and contains an old castle, a hospital, arsenal, and two churches. The university, which was founded in 1607, has 58 teachers and about 400 students, a library of 40,000 volumes, an observatory, botanical garden, and museum. Its school of organic chemistry under Liebig has been especially distinguished. Besides the university Giessen has a gymnasium and several other superior schools. Its manufactures consist of hosiery, hats, soap, candles, red and white leather, jewelry, weapons, liqueurs, vinegar, and tobacco. It has also breweries and oil mills, and a considerable trade in cattle.

GIFFORD, Helen Selina, countess of, an English poetess, born in 1807, died June 13, 1867. She was a daughter of Richard Brinsley Sheridan, and sister of the duchess of Somerset and of the Hon. Mrs. Norton. She married in 1825 Price Blackwood, a captain in the navy, afterward fourth Baron Dufferin, who died July 21, 1841. In order to be better able to attend her intimate friend, the earl of Gifford, in his illness, she married him in 1862, about ten weeks before his death. She was celebrated for her wit, and in her early days for her beauty, and wrote many songs and ballads, including "The Irish Emigrant's Lament" and "The Farewell of Terence." The present Earl Dufferin, governor general of Canada, is her eldest son.

GIFFORD, Robert Swain, an American painter, born in Naushon, Mass., Dec. 23, 1840. He studied in New York with Albert Van Beest, and in 1869 made an extensive sketching tour through California and Oregon, and furnished for Appleton's "Picturesque America" (1872-'3) views of the Columbia river, northern California, and the coast of California. He spent the year 1870 and a part of 1871 in Europe, Egypt, and northern Africa, making sketches. Among his best works are "The Rock of Gibraltar" and "A Lazy Day in Egypt."

GIFFORD, Sanford Robinson, an American painter, born in Greenfield, Saratoga co., N. Y., July 10, 1823. His childhood and youth were passed at Hudson, and in 1842 he entered Brown university, where he remained till 1844, when he went to New York and studied drawing, perspective, and anatomy, with a view to figure painting; but in 1845 he determined to devote himself to landscapes. In 1851 he became an associate of the national academy, and in 1854 an academician. In May, 1855, he went to Europe, spent the summer sketching in England and Scotland, passed the following winter in Paris, and in the summer of 1856 made a pedestrian tour through Belgium, Holland, Switzerland, and Italy. The next winter

he passed in Rome, and the summer of 1857 in a sketching tour, in company with Albert Bierstadt, through the Abruzzi and around Naples, and later through parts of Austria. He returned to New York in September. In 1861, at the outbreak of the civil war, he joined the 7th New York regiment and accompanied it to Washington. He was also out with it in 1862 and 1863. In 1868 he went abroad again, and spent two years sketching in Italy, Greece, Syria, and Egypt. Among the best of Gifford's pictures are the following: "Kauterskill Clove," "Twilight" (1859), "Bivouac of the 7th Regiment at Arlington Heights" (1861), "Baltimore, 1862," "A House in the Wilderness" (1866), "Hunter Mountain" (1866), "Sunrise on the Seashore" (1867), "Shrewsbury River" (1868), "Mansfield Mountain" (1869), "San Giorgio" (1869), "Fishing Boats of the Adriatic" (1870), "Pallanza" (1870), "Tivoli" (1870), "A Venetian Twilight, Santa Maria di Salute" (1871), "Monte Ferro, Lake Maggiore" (1871), "The Golden Horn" (1872), "Schloss Rheinstein" (1873), and "Sunset on the Sweetwater, Wyoming Territory" (1874).

GIFFORD, William, an English author, born in Ashburton, Devonshire, in April, 1757, died in London, Dec. 31, 1826. He was left an orphan in childhood, and apprenticed to a shoemaker. His master refused to allow him time for reading, but he contrived by stealth to acquire a considerable knowledge of mathematics, and occasionally wrote verses. Some of the latter came into the hands of Mr. Cookesley, a surgeon, who raised a subscription to purchase his freedom. In two years he entered Exeter college, Oxford, where he was appointed Bible reader. Lord Grosvenor invited him to live with him, and subsequently sent him to the continent as the travelling tutor of his son. After his return to England, he published in 1794 his "Baviad," a paraphrase on the first satire of Persius, in which the popular Della Cruscan poetry of the day was happily ridiculed and effectually put down; and in 1795 the "Mæviad," an imitation of Horace, directed against the corruptions of the drama. His "Epistle to Peter Pindar," published in 1800, is one of the bitterest attacks ever directed against an opponent. Being now known as a keen political writer, he wrote with George Ellis and Frere for the "Anti-Jacobin" upon its commencement by Canning, and from this connection received two offices under government, which he held for life. In 1802 he published a spirited translation of Juvenal, with his own autobiography. He also translated Persius, and edited the dramatic works of Massinger, Ben Jonson, Ford, and Shirley. Upon the establishment of the "Quarterly Review" in 1809 he became its editor, a post which he retained until about two years before his death.

GIFT, a voluntary transfer of property of any kind. The word "give" is generally employed among the words of transfer in deeds of land;

but by gifts, in law, are usually meant transfers of chattels or presents which are wholly without any pecuniary consideration, or any other consideration which the law recognizes as valid. They are usually divided into gifts *inter vivos* and gifts *causa mortis*. The latter are called in English gifts in prospect of death; and the former phrase, or gifts between the living, is not accurate, as describing but one class of gifts, because it applies to all, as only the living can give, and they can give only to the living. But gifts *causa mortis* may be defined as gifts made by one believing himself, on reasonable grounds, to be very near his death, and made in view of and because of this apprehension; and gifts *inter vivos* are all those which are not gifts *causa mortis*.—First, as to gifts *inter vivos*. Any person competent to transact ordinary business may give whatever he or she owns to any other person. The usual disabilities for legal action would apply here. Thus, a gift by an infant (*i. e.*, a minor), a married woman, an insane person, or a person under guardianship, would be wholly void, or would be voidable by the giver or one having authority to represent the giver, in much the same way that a transfer for consideration would be. Gifts, by persons competent to give, of property which they have a right to give, to persons competent to receive, and which are completed and effectual, are regarded by the law as executed contracts, founded upon mutual consent. It is absolutely essential to the validity of a gift that it should go into effect at once and completely. If it be not a thing of the present, now done and finished, then it is no longer an act, but a promise. And as it must be, if a promise, wholly without consideration, because otherwise it is not a gift, it comes under the rule of law which makes promises without consideration of no legal validity, and incapable of legal enforcement. Hence, the very first rule in the law of gifts is, that delivery is essential to a gift. And this delivery must be to the donee; even if the giver deliver the money to a third person with orders to give it to the donee, and will therefore be bound if this third person give it to the donee before revocation, the giver may, at any time before the delivery to the donee, annul his directions to the party holding the money, and revoke and reclaim the gift. Generally, a court having equity powers will not interfere to enforce or complete a gift which is merely intended and promised. Nor will the transfer, if without delivery, be any the more effectual for being made in writing. As there must be actual delivery, so there must be actual acceptance; in other words, the thing given must pass out of the present power and possession of the giver, and into that of the donee. It is nevertheless true that a thing may be given, of which the present and immediate manual delivery is impossible. The delivery may, in such a case, be constructive, or symbolic, or

any such delivery as the nature and actual position of the thing at the time may permit and require; as a delivery of a key which commands access to the thing, or a delivery of a part for the whole, where the whole is too bulky to be delivered otherwise. So also the delivery may be by an order upon a warehouseman or other person having the thing in his custody; but in this case the gift is not complete and effectual until the order has been presented and completed or performed by the party on whom it is drawn. From the same necessity of completing the gift by delivery and acceptance, and from the same rules which make a mere promise without consideration voidable, it follows that if a gift be made by a note, or any instrument not under seal (for a seal is the equivalent of a consideration), it may be revoked by the donor. So if it be made by a check, draft, bill, or order, the giver may revoke it at any time before it is paid or executed, or accepted in such a way as to bind the drawee. A gift by a competent party, made perfect by delivery and acceptance, is then irrevocable so far as the donor himself is concerned; but it may still be revoked or annulled, and the property resumed, by the creditors of the giver, if the giver at the time of the gift was insolvent, and by the gift diminished the fund to which his creditors were entitled. But it is thus void only in reference to existing creditors, and not as to persons becoming creditors subsequently, unless made when the insolvency was actual or immediately expected, or with actual fraudulent purpose as to future creditors. All voluntary transfers, as settlements of every kind and the like, if made in fraud of creditors, are considered as gifts in the law, and are void. In most of the United States the statutes respecting insolvency provide especially for all cases of this kind.—Gifts *causa mortis* can be made only when the donor has reason to believe that death is impending. The law watches over gifts *causa mortis* with great jealousy, and restrains them by rigorous principles and wise precautions, for the same reasons which induce it to lay down such precise and rigid rules in relation to wills and all testamentary dispositions. This reason is not any unwillingness that the wishes of the dead or of the dying should have their full effect, but from the extreme difficulty of giving them this effect, and yet closing the door effectually against, on the one hand, false and supposititious expressions of his will, or, on the other hand, undue and injurious influence exerted upon him as to the disposition of his property. Both of these reasons apply as strongly and directly to gifts made in prospect of death as to wills, or perhaps more so. Indeed, as these gifts are not unfrequently made in substitution of wills, and to avoid the special requirements made by the law in respect to wills, this is another reason why the law regards them with the suspicion felt toward acts

which are evasions of law. Much that was said of gifts *inter vivos* is equally or indeed much more strongly applicable to gifts *causa mortis*. Thus, there must be not only delivery and acceptance, but this must be strictly actual, if that be possible without extreme inconvenience; and if impossible, in that case it must be something that is as near actual delivery as may be possible. It has even been said that no mere possession, although previous and continuous, is sufficient without delivery; as if the giver should say, "You may have and keep as your own the watch I have permitted you to wear for a year, and which is now in your pocket," this would not pass the property in the watch unless the giver took it into his own hands and gave it back to the donee; but we doubt whether the rule would be applied with so much severity. We have no doubt that the giver, if physically incapable, or perhaps if only unwilling to make the effort, might, without doing anything himself, as well and effectually direct another in his presence to take such a thing and give it to such a donee, to be kept by him as his own. After some fluctuation it seems now to be settled that the donor's own note, or his own check, draft, or bill, not paid or accepted before his death, is not a valid gift *causa mortis*; that is, the executor or administrator of the deceased may refuse to pay his note, and may revoke his bill or draft, and order the drawer not to pay it. But bank notes certainly, and probably all notes of other parties payable to bearer, or indorsed in blank, and perhaps all notes, bonds, and other written contracts of other parties, may be the subjects of a valid gift *causa mortis*. One rule is perfectly certain: one who makes a gift in prospect of death may revoke his gift at any time during his life, although it be completed and executed by delivery and acceptance. Any such distribution of his property is, in the language of the law, ambulatory, or changeable at his own pleasure, so long as he remains alive; and it is sometimes said that his recovery does of itself revoke and annul such a gift made in prospect of death, because the cause and ground of it have ceased to exist. We should say, however, that if the giver, with full means of actual revocation, did not choose to revoke his gift, it became changed by his recovery from a gift *causa mortis* to a gift *inter vivos*. Within these rules and restrictions there seems to be no limit in law to the possible amount of a gift *causa mortis*. It should be added that gifts in prospect of death are equally void as against existing creditors with gifts *inter vivos*.

GIGNOUX, François Régis, a French painter, born in Lyons in 1816. His art education was acquired chiefly in Paris, where he was under the instruction of Delaroche, Vernet, and other eminent masters. In 1840 he settled in New York, and devoted himself to landscape painting. Among his best works are "The Dismal Swamp in Autumn," "Niagara in Winter," "Virginia in Indian Summer," "Four Seasons

in America," "First Snow," "Winter in Vermont," and "Bernese Alps by Sunrise." Since 1870 he has lived in France.

GIGOUX, Jean François, a French painter, born in Besançon in 1806. He is said to have been originally a blacksmith, and became famous in 1835 by his "Death of Leonardo da Vinci." In 1850 he exhibited "The Dead Christ" and "The Death of Cleopatra," and in 1852 "Galatea," which he has also engraved. One of his largest works, executed for the council of state and representing "Charlemagne dictating his Capitularies," was burned in 1871.

GLION, a seaport of Asturias, Spain, on the bay of Biscay, in the province and 15 m. N. N. E. of the city of Oviedo; pop. about 10,500. It is built on a low headland, surmounted by a hill. Some ancient walls surround the upper or old town, and a fortress and batteries guard the new town, which reaches down to the shore. The former Augustinian convent is used as a cigar manufactory, employing 1,400 persons. There are active fisheries, and some coasting trade. The harbor is safe, though not easily accessible. The first quay was built here under Charles V. in 1552-4, and a new one was constructed in 1768. The Spanish armada was repaired here in 1588. In 1810 the town was sacked and its shipping destroyed by the French, under Bonnet.

GILA, a river of New Mexico and Arizona, the principal tributary of the Colorado river of the West. It rises in the Sierra Madre mountains in Socorro co., New Mexico, flows S. W. to near the Arizona boundary, where it bends S. and then pursues a general W. course through that territory to its junction with the Colorado, about 180 m. above its mouth. Its sources are about 5,000 ft. above the sea. The principal tributaries from the north are the Rio Nutroso, Prieto, Bonito, San Carlos, Salt river or Rio Salado, and Agua Fria creek; from the south the Rio San Domingo and San Pedro. The Santa Cruz river, after a course of nearly 100 m., is lost in the sands of the desert, and seldom discharges its waters into the Gila. For more than half its entire length, which is nearly 500 m., the Gila passes through mountains, and in some places is unapproachable, being buried between walls of perpendicular rock nearly 1,000 ft. high. It emerges from the mountains in lon. 111° 25' W., after which its course is through an open and comparatively level country to its termination. In the last 300 m. it has an average fall of 5 ft. per mile, and averages 60 ft. in width, 3 ft. in depth, and in velocity 2 m. an hour. In the lower portion the valley is from 1 to 3 m. wide; about 150 m. from its mouth there is a considerable bend to the north, where the valley for 25 m. is from 5 to 10 m. wide. The valley is in many places covered with mezquite and cottonwood, and on its margin with the willow. Several varieties of cactus, including the pitahaya (*cereus giganteus*), grow on the table land near the river, but never in the alluvial lands in its valley.

The ruined edifices, broken pottery, and traces of irrigating canals found along this river, show that its former population was much larger than at present. One of these structures is three stories high and in good preservation. The others are in a ruined state, and present little more than dilapidated walls, tumuli, mounds, &c., of crumbling adobe, of which the buildings were constructed. (See *Casas Grandes*.) About 200 m. from the Colorado, in one of the finest portions of the valley, is the reservation of the Mariopaa and Pimo Indians. It is intersected in all directions by irrigating canals, and produces abundant crops. Further E., among the mountains, are many luxuriant valleys where once existed a considerable population, as is evident from the traces of cultivation and the ruins which remain.

GILBERT, Sir Humphrey, an English navigator, half brother of Sir Walter Raleigh, born at Dartmouth in 1589, lost at sea about the end of 1588. He was educated at Eton and Oxford, followed the military profession, and was knighted in 1570 for his services in Ireland. Being interested in geographical discovery, both from love of fame and of adventure, he sailed in 1583 with five vessels and 260 men, prepared to take possession of the northern parts of America, and founded a colony in Newfoundland, which, however, did not prove permanent. On the return his vessel, of only 10 tons burden, foundered, and all perished. He published a book in 1576, "A Discourse of a Discovery for a new Passage to Cathay," to prove the possibility of a N. W. passage.

GILBERT, Sir John, an English painter, born in 1817. He exhibited in 1836 a water-color drawing, "The Arrest of Lord Hastings," in the Suffolk street gallery, and an oil painting in the royal academy. In 1839 he first exhibited in the British institution, where he has been represented almost every year since. He has made many illustrations for books and pictorial newspapers, especially for the British classics, concluding with an edition of Shakespeare, and for the "Illustrated London News." In 1852 he was elected an associate, in 1853 a member, and in 1871 (when he was knighted) president of the society of painters in water colors. He is an associate of the royal academy, and honorary president of the Liverpool society of water-color painters. His best known oil paintings are "Don Quixote giving advice to Sancho Panza," and other subjects from Cervantes; "The Education of Gil Blas;" "A Scene from Tristram Shandy;" "Othello before the Senate;" "The Murder of Thomas à Becket;" "The Plays of Shakespeare," introducing the principal characters in each play; "Charge of Cavaliers at Naseby;" "A Drawing-room at St. James's;" "A Regiment of Royalist Cavalry;" "Rubens and Teniers;" "The Studio of Rembrandt;" "Wolsey and Buckingham;" "A Convocation of Clergy;" and "The Entry of Joan of Arc into Orleans."

GILBERT, William S. See supplement.

GILBERTINES, an English religious order, so called from the founder, St. Gilbert of Sempringham (born in 1083, died Feb. 4, 1189). They were also called the "Order of Sempringham." Gilbert, who was by birth lord of Sempringham and Tirington, had become as a priest pastor of both places. He first built a convent near the church of St. Andrew for seven poor maidens, which became so flourishing that he was called upon to establish several others in various parts of the kingdom. Having in vain endeavored to unite these houses to the order of Cîteaux, Gilbert built a monastery of canons regular near each convent, gave to the canons the rule of St. Augustine, to the nuns that of St. Benedict, and placed the lay brethren who served them under the rule of Cîteaux. This order with its constitutions was approved by Eugenius III., and confirmed by his successors. It numbered at the founder's death 18 double convents, besides hospitals for the sick and asylums for widows, orphans, and the poor, with 800 monks and upward of 1,200 nuns. The Gilbertines were confined to England. Sempringham afforded an asylum to Thomas à Becket during his quarrel with Henry II. At the suppression of monasteries under Henry VIII. the order possessed 21 houses and 11 double convents. The Gilbertine rule is given in full by Holstenius. See also Hurter, *Geschichte des Papstes Innocenz III. und seiner Zeitgenossen*.

GILBERT ISLANDS, or **Kingsmill Group**, a cluster of coral islands in the Pacific, on both sides of the equator, between lon. 172° and 174° 30' E.; pop. estimated at 60,000. The largest are Taputeouea or Drummond, and Tarawa or Cook islands, the former 30 m. long by about $\frac{1}{4}$ or $\frac{1}{2}$ m. wide, and the latter 20 m. long. Almost the only cultivated products are the cocoanut and pandanus, which form the staples of food, and a species of taro (*arum cordifolium*), highly prized by the natives. The breadfruit is found on the northern, though not on the southern islands. The climate is equable, and though warm is not very oppressive. The inhabitants resemble the Malays. The people are divided into three classes, chiefs, landholders, and slaves. There is no general authority recognized throughout the group, but there are several kings, one of whom rules over three of the islands, while others are scarcely respected in any. In some places the government is administered by public assemblies. The islanders are fond of war and prone to suicide, but they are kind to their children, generous, hospitable, and more considerate of women than is usual among savages. They are said to eat human flesh occasionally, but are not habitual cannibals. Their clothing is made of the leaves of the pandanus; their houses and canoes, though constructed of rude materials, are superior in size, strength, and elegance to any others in the Pacific. The islands have several good harbors, but are seldom visited by vessels.

GILBOA, a mountain in Palestine, between the river Jordan and the plain of Esdraelon, the scene of the defeat and death of Saul and Jonathan. The name Gilboa signifies a bubbling fountain, and was probably taken from a large fountain at the northern base, called in Scripture the well of Harod, or the fountain of Jezreel. The ancient name is preserved in the village on the mountain, called now Jelbun, and in the time of Jerome Gelbus. The fountain is now known as Ain Jalud. The mountain rises not more than 600 ft. above the plain, but extends E. and W. about 10 m. Its sides are white and barren. Near the fountain of Jezreel was the ancient city of that name, and at this place the Israelites encamped before the battle; while the Philistines pitched at Shunem (now Solam), 8 or 10 m. north, upon the opposite rising ground. The battle was fought, according to the common chronology, in the year 1055 B. C.

GILDAS, surnamed "the Wise," a British historian, born, according to some authorities, in 498, according to others in 511, died in 570 or 590. He was the son of Oaw, a British prince who emigrated to Wales to avoid subjection to the Anglo-Saxons, and the Welsh bard Aneurin is supposed to have been the same person or his brother. (See ANEURIN.) His only complete work extant is a short Latin composition on British history, entitled *De Calamitate, Excidio et Conquestu Britannia*, in which he mourns over the ruin of his country, and inveighs against the British kings and clergy. It was first published by Polydore Vergil in 1525, and has been often reprinted. The best edition is by Stevenson, under the care of the English historical society (London, 1838). Translations have been published by Habington (1638), and by Dr. Giles in "Bohn's Antiquarian Library" (1848). It is said by Wright that there is no independent authority for the existence of Gildas, or for the historical truth of the work attributed to him, which he regards as a forgery of the 7th century.

GILDEMEISTER, Otto, a German writer, born in Bremen, March 13, 1823. He studied at the university of Bonn, and became in 1845 connected with and in 1850 editor-in-chief of the *Weserzeitung*. In 1852 he was chosen secretary of the Bremen senate, in 1857 senator, in 1866 representative in the diet of the North German confederation, and in October, 1871, burgomaster. He has translated into German the complete works of Byron (6 vols., Berlin, 1864), and many plays of Shakespeare for Bodenstedt's complete edition; and his version of Shakespeare's sonnets was published in 1871.

GILDING, the covering of the surfaces of bodies with a thin coating of gold. This method of economizing the precious metal, and imparting to solid bodies the appearance of being wholly composed of it, was practised at very remote periods. The sacred books allude to it; in Exod. xxvi. 29 there is a com-

mand to overlay boards and bars with gold. That the early Egyptians understood it well is evident from the gilding of the coffins of Theban mummies, in which the gold leaves resemble those now prepared. Homer makes mention of it, and the later Greeks thus decorated the exterior sculpture of their temples and statues. The Romans after the destruction of Carthage applied the process to ornamenting the ceilings of their public buildings, and at last of their private houses also. The thickness of the leaf is spoken of by Martial as like a vapor, and by Lucretius the substance is compared to a spider's web. According to Pliny, an ounce of gold was made into 750 leaves, each four fingers square. This is about three times the thickness of the leaf now in common use; but some qualities are so thin that 290,000 sheets make a pile only one inch in height; and specimens have been made only $\frac{1}{87,500}$ of an inch thick, which is 1,200 times thinner than ordinary printing paper. In modern times the use of gilding in architecture has been carried to the greatest extent by the nations of Further India. It is practised by them with great skill and in the most profuse manner.—Besides the method of gilding by covering objects with gold leaf, there are processes of modern invention, distinguished as chemical gilding, in which the gold is incorporated with the substance of the article it covers, and the same quantity is thus made not merely to spread over a much larger surface, but to be permanently attached to metallic bodies, so as to withstand the action of heat and of atmospheric agents without injury; an art incompatible with the attainments of the ancients in chemistry.—Gilding with gold leaf is distinguished as the mechanical branch of the art; and of this there are two distinct processes, one of which is called burnish gilding or gilding in distemper, and the other oil gilding. In the former the article to be ornamented, as the moulding of a picture frame, is received from the joiner before it is made up. A priming of hot size and whitening is first applied, and when dry all irregularities in the moulding are corrected with the same composition, made of the consistency of putty, which then receives four or five coats of the priming. This, which is now $\frac{1}{8}$ to $\frac{1}{4}$ of an inch thick, is carefully trimmed around the edges and smoothed with pumice stone and glass paper. This is the foundation for the so-called gold size (the bed upon which the gold leaf is to be laid), a composition of clay, red chalk, plumbago, suet, and bullock's blood; or, as used by the French, of a pound of Armenian bole to two ounces of red hematite and as much galena, each ground by itself in water, then mixed and ground with a spoonful of olive oil, and at last tempered with a clear white glue carefully prepared from sheep skins. When used, it is first melted with thin size, and while warm is laid on with a brush. The leaf is then laid on by means of a brush

called a tip, an operation which requires considerable dexterity. When the whole is covered and dried, the work, or any portion of it, is burnished with smooth agates or flints set in handles for this use.—Oil gilding is practised by several different methods. For large objects, especially those exposed to the weather and of metallic composition, the priming used in Paris is white lead mixed with linseed oil and a little oil of turpentine. For equipages and indoor work a varnish polish is much used over the gold. For elaborately designed frames oil gilding and burnish gilding are often employed upon the same piece, care being taken that the applications for the former do not touch the spots intended to be burnished, which are treated in the manner already described. The frames intended for this process are furnished to the gilder made up. They are then thoroughly washed, and afterward receive two or three coatings of thin white, and more upon the parts to be burnished. A strong size called clear cole is then laid in several coats over those parts only intended for oil gilding, and upon this the oil gold size, a mixture of boiled linseed oil and ochre. By standing over night this becomes ready for the gilding, which is effected without using water. The gold leaf is pressed with cotton wool into all the depressed portions, and when all is laid the work is smoothed over with a brush, by which its irregularities are removed, and the gold is uniformly distributed.—Book covers are ornamented with gilt letters and figures in the following manner. If of cloth, the leaf is laid on over the parts to be ornamented, and the cover is then placed in a press, in which a heated metallic block, having the intended designs cut upon its face, is powerfully pressed against the cover as in printing. The heat of the block causes the glue on the back side of the cloth to melt and come through, and thus fasten the figure to the fabric. Leather covers receive an application of gelatine or of the white of egg dissolved in water, upon which when dry an almost imperceptible application of oil is made with a rag, and the gold leaf is then laid to be pressed as in the case of the cloth. The edges of the leaves are gilded in the bookbinder's press, the same gelatine solution and oil being applied, upon which the gold leaf is laid and afterward burnished. Chemical gilding is particularly applicable to metallic surfaces, but other surfaces, as of wood, leather, or paper, may be coated with some preparation by which they are rendered fit for it.—Wash or water gilding is the branch of this art in which the gold is applied by means of an amalgam of gold and mercury. In other processes it is deposited from its solution. Copper, or an alloy of copper with a little zinc, or zinc and nickel, or brass, is well suited for the amalgamation process; the nearer the color is to that of gold the better. The surface to be gilded must first be thoroughly cleaned and brightened and freed from oil; and it is then advisable to wash it over with a

solution made of 100 parts by weight of mercury in 110 of nitric acid, of specific gravity 1.33, diluted with 25 times the weight of the whole of pure water. This application leaves a coating of mercury upon the metal, which is more ready to take the amalgam than is the metal itself. Both the mercurial solution and amalgam are sometimes applied together by means of the gilder's scratch brush, which is dipped into the former and immediately rubbed over the latter, and then applied to the metal; the process being repeated as often as necessary. After the application the article is washed in water and exposed to glowing charcoal to expel the mercury. The amalgam is prepared by heating small particles of gold to redness and throwing them into a quantity of mercury heated so as to emit fumes, and stirring with an iron rod till the gold is dissolved. There should be about eight times as much mercury as gold, the excess of the former being removed by squeezing the amalgam through buckskin. The composition then contains about 67 parts of mercury to 33 of gold. The gold thus deposited is of a dull yellow, and still retains some mercury, which is removed after washing and scrubbing the article with a scratch brush acidulated with vinegar, by applying gilding wax, and again heating. The wax is a mixture of beeswax with some of the following substances, viz.: red ochre, verdigris, copper scales, alum, vitriol, borax. When the wax is burned off, the color of the gilding is found to be improved, and it is still further heightened by burnishing. The amalgamation process is not well adapted for gilding articles of iron and steel, an oxide of iron being produced by the acid applications, which prevents the adhesion of the amalgam. For these the best method is to cover them with gold leaf. Copper may be treated in the same way. The metal is heated till it begins to assume a blue color; a sheet of gold leaf is then laid on and gently pressed with a burnisher, and the article is again heated. Other sheets are laid over the first to the desired thickness and heated, and the last is burnished down cold. The surface of iron, whether wrought or cast, or of steel, is sometimes covered with a coat of copper.—To gild silver, a very good process is that called cold gilding. Sixty grains of fine gold and 12 of rose copper are dissolved in two ounces of aqua regia. The whole of the solution is absorbed by linen rags, which are then dried and burned to ashes. The black powder thus obtained is applied upon the silver, which has been annealed and polished, and is rubbed with a piece of moistened cork or washed leather. Burnishing completes the process.—A method of gilding buttons and other articles by immersing them in solutions of gold was introduced into the establishment of the Messrs. Elkington, in Birmingham, in 1836, by which the injurious effects of the amalgamating process on the health of the workmen were avoided. To a solution of chloride of gold prepared from one part of gold,

80 parts of bicarbonate of potassa are gradually added, and then 80 parts more of bicarbonate dissolved in 200 parts of water. The whole is then boiled two hours, and the color of the liquid changes from yellow to green. The articles, being perfectly well cleaned and annealed, are immersed for an instant in a mixture of equal parts of nitric and sulphuric acids, to which, if the gold is intended to have a dead appearance, a little chloride of sodium is added. The articles, washed in water, are plunged in the gold solution, and left half a minute, when they are removed, again washed, and dried in hot sawdust. Articles of German silver, of platinum, or of silver, may be gilded by suspending them by copper or zinc wires for a time in the liquid.—For gilding porcelain or glass, gold precipitated by sulphate of iron is mixed with $\frac{1}{15}$ its weight of oxide of bismuth and a small quantity of borax and gum water, and the mixture is then applied with a camel's hair pencil. The article is heated in a muffle, and when taken out the gold is burnished, and finally cleansed with vinegar or white lead. Vases and articles not exposed to wear may be gilded by fixing gold leaf upon them with copal varnish. Silks or other woven fabrics may be gilded by immersing them in a neutral solution of terchloride of gold, or moistening them with it in design, and then exposing them to the action of hydrogen, which reduces the gold to a metallic state.

GILEAD, the name of a mountain group in the eastern division of ancient Palestine. From it the southern districts of the same division were also called Gilead, which is often mentioned in contradistinction to Bashan in the north, but exceptionally also as including the latter region. This was rich in pastures, and renowned for its aromatic simples, from which balsam was prepared. Among its rivers were the Jabbok and the Arnon.

GILES. I. A S. W. county of Virginia, intersected by Kanawha or New river; area, 350 sq. m.; pop. in 1870, 5,875, of whom 598 were colored. The surface is high and rugged, the mean elevation being 1,600 ft. above the sea; the principal summits are Peter's and Walker's mountains. The soil of the uplands is poor, but the valleys and river bottoms are very fertile. The chief productions in 1870 were 53,598 bushels of wheat, 12,633 of rye, 105,402 of Indian corn, 23,474 of oats, and 1,351 tons of hay. There were 1,295 horses, 1,346 milch cows, 2,095 other cattle, 4,471 sheep, and 5,247 swine. Capital, Pearisburg. II. A S. county of Tennessee, bordering on Alabama, watered by Elk river and some of its branches; area, 600 sq. m.; pop. in 1870, 32,413, of whom 12,738 were colored. It has a slightly uneven surface and a fertile soil. The chief productions in 1870 were 145,635 bushels of wheat, 2,054,163 of Indian corn, 70,512 of oats, 32,556 of Irish and 28,074 of sweet potatoes, 228,560 lbs. of butter, 1,644 tons of hay, and 8,867 bales of cotton. There

were 7,672 horses, 3,458 mules and asses, 6,536 milch cows, 9,886 other cattle, 13,658 sheep, and 47,700 swine; 2 manufactories of cotton goods, 7 of saddlery and harness, 1 of tin, copper, and sheet-iron ware, 2 flour mills, 11 saw mills, 6 tanneries, and 5 currying establishments. Capital, Pulaski.

GILES, Henry, an American clergyman and lecturer, born in county Wexford, Ireland, Nov. 1, 1809. He was educated in the Roman Catholic church, but after various changes of opinion joined the Unitarians, and officiated as pastor in Greenock for two years, and in Liverpool for three years. In 1840 he came to America, where he has been extensively engaged in lecturing, with occasional services in different parishes as a preacher. He has published "Lectures and Essays" (2 vols., Boston, 1845), "Christian Thoughts on Life" (1850), and "Illustrations of Genius in some of its applications to Society and Culture" (1854). He has also written much for periodicals, has addressed literary societies and library associations, and given a course of lectures before the Lowell institute in Boston on the "Genius and Writings of Shakespeare." He now (1874) resides in Quincy, Mass.

GILES, William Branch, an American statesman, born in Amelia co., Va., Aug. 12, 1762, died at "The Wigwam," in the same county, Dec. 4, 1830. He entered Princeton college, N. J., but left it before completing the usual course. He studied law with Chancellor Wythe, was admitted to the bar, and practised for five or six years. In 1790 he was elected by the federal party in the Petersburg district to fill a vacancy in congress, and was several times reelected. His opposition to the bill creating a bank of the United States led to his estrangement from the federal party, and to his affiliation with the democrats. On Jan. 23, 1793, he made in the house an attack upon Alexander Hamilton, then secretary of the treasury, charging him with corruption and speculation. Hamilton vindicated himself triumphantly in a report, and Giles replied by proposing resolutions censuring the secretary for undue assumption of power, and for want of respect for the house. These resolutions were laid on the table by very large majorities. In 1796 Giles strongly opposed the creation of a navy and the ratification of Jay's treaty with Great Britain, and in 1798 the proposed war with France for her outrages on American commerce. In the latter year he became a member of the legislature of Virginia, where he cooperated with Madison in procuring the passage of the celebrated resolutions of '98. In 1801 he was again elected to congress. In 1804 he was chosen United States senator, and took at once the position of democratic leader in the senate, and held it till 1811, when he openly manifested his opposition to the administration of President Madison. He abandoned public life in 1815, and remained in retirement till 1826, when he was induced

to become a member of the legislature of Virginia, principally from his strong opposition to the project of calling a convention to revise the constitution of the state. In the same year he was elected governor, and held the office for three years. The bill for calling a convention was revived and passed at the session of 1827-'8, and Mr. Giles while governor was chosen a member of it. The convention sat in 1829-'30, and he took a distinguished part in its deliberations. He published in 1813 "Political Letters to the People of Virginia," and subsequently various letters.

GILFILLAN, George, a Scottish author, born at Comrie, Perthshire, in 1813. The son of a minister of the Secession church, he was educated for the same profession, and has officiated since 1836 as minister of the School wynd congregation in Dundee. His first literary sketches appeared about 1842 in the "Dumfries Herald," and were collected in 1845 under the title of "A Gallery of Literary Portraits;" a second series appeared in 1849, and a third series in 1855. He has also published "Bards of the Bible" (1850); "The Book of British Poesy, Ancient and Modern" (1851); "The Martyrs, Heroes, and Bards of the Scottish Covenant" (1852); "The Grand Discovery" (1854); "History of a Man" (1856); "Christianity and our Era" (1857); "Alpha and Omega," a collection of sermons (1860); and "Night," a poem (1867). He has contributed much to periodicals, and has edited a collection of "British Poets," in 48 vols.

GILL, Edmund. See supplement.

GILLESPIE, a S. W. central county of Texas, watered by affluents of the Colorado; area, 925 sq. m.; pop. in 1870, 3,566, of whom 77 were colored. It has a hilly surface, about one tenth of which is suitable for farming, while the remainder furnishes good pasturage. Iron ore, limestone, and coal are the most important minerals. The chief productions in 1870 were 15,588 bushels of wheat, 82,135 of Indian corn, and 916 tons of hay. There were 880 horses, 20,024 cattle, 2,178 sheep, and 3,846 swine. Capital, Fredericksburg.

GILLESPIE, William Mitchell, an American author, born in New York in 1816, died there, Jan. 1, 1868. He graduated at Columbia college in 1834, and spent nearly ten years in Europe in travel and study. On his return to New York in 1845, he was appointed professor of civil engineering in Union college, a post which he held until his death. His published works are: "Rome as seen by a New Yorker, 1843-'44" (1845); "Roads and Railroads; a Manual for Road-making" (1845; 10th ed., 1871); "Philosophy of Mathematics," from the French of Auguste Comte (1851); "The Principles and Practice of Land Surveying" (1855); and "Treatise on Levelling, Topography, and Higher Surveying," edited by C. Staley (1870).

GILLIES, John, a Scottish historian, born in Brechin, Forfarshire, Jan. 18, 1747, died in Clapham, near London, Feb. 15, 1836. He

was educated at the university of Glasgow, where he became professor of Greek. In 1778 he published a translation of the "Orations of Lysias and Isocrates." In 1786 he published in London his "History of Ancient Greece." In 1793, on the death of Dr. Robertson, he was made historiographer royal for Scotland. His principal works, besides those above named, are a "Translation of Aristotle's Ethics and Politics" (1804); the "History of the Ancient World from Alexander to Augustus" (London, 1807), which was afterward republished as the second part of his "History of Greece;" and a "Translation of Aristotle's Rhetoric" (1828).

GILLIFLOWER, the trivial name of the garden species of *mathiola*, usually called stocks by the florists, and sometimes stock gilliflowers and gillies. The name gilliflower has a curious origin: the French applied to this and other spicy-smelling flowers the term *giroflee*, clove-

Gilliflower (*Mathiola incana*).

scented; this, through the old spellings of *gyllifer* and *gilefre* (with the *e* long), has become our gilliflower. Florists divide the plants into ten-weeks, intermediate, Brompton, and emperor stocks, and each of these into several subdivisions. The ten-weeks and intermediate stocks are annuals, and are garden varieties of *M. annua*, a native of the seacoast of Europe, and a member of the large order *crucifera*; the flower in the wild state is reddish, but cultivation has produced a great variety of colors from pure white to dark purple; the seedsmen's catalogues present new varieties each year. The double varieties do not produce seeds, but such is the tendency to depart from the normal state that the seeds of single flowers will produce plants one half or more of which will be double; the seeds are imported from Germany, where great pains are taken in their production. The seeds of these varieties may be sown in the open ground when the soil becomes warmed, and treated as ordinary an-

nuals, or they may be sown in a hotbed, the young plants potted when large enough, and later turned out into the open border. Seeds may also be sown in August and September, and the young plants potted and kept over winter in a cool greenhouse, to be turned out

Double Gilliflower.

in spring. The Brompton stocks must be treated as biennials, as the original species, *M. incana*, is a biennial or a short-lived perennial. It does not endure our winters, and the plants must be potted and kept either in a frame or a light cellar until spring, or brought into bloom in the greenhouse or window during winter. Choice varieties may be increased by cuttings; and if the plant after flowering is headed back, it may be kept for several years.

GILMORE, Quincy Adams, an American soldier and engineer, born at Black River, Lorain co., Ohio, Feb. 28, 1825. He graduated at West Point in 1849, and served in the engineer corps and as assistant instructor at West Point till the outbreak of the civil war, when he distinguished himself by his services at Hilton Head, S. O. (1861), in the siege and capture of Fort Pulaski, Ga. (1862), and especially in the reduction of Forts Sumter and Wagner (1863-'4). He was made major general of volunteers July 10, 1863, resigned this commission Dec. 5, 1865, and now (1874) ranks as major in the corps of engineers, and is engineer in charge of the defences of the Atlantic coast. He has published "Siege and Reduction of Fort Pulaski" (New York, 1863); "Practical Treatise on Lime, Hydraulic Cements, and Mortars" (1863); and "Engineer and Artillery Operations against the Defences of Charleston Harbor in 1863" (1865).

GILLOTT, Joseph, an English manufacturer, born in Warwickshire about 1800, died in Birmingham, Jan. 6, 1872. He began life as a grinder of cutlery in Sheffield. Then he removed to Birmingham, and with the assistance of his wife began the manufacture of steel pens. It is said that he made them in a garret and sold them to small shopkeepers about the town.

They were the black "barrel" pens, and were very stiff and scratchy compared with the quills which they were intended to supersede. In 1820 Gillott made the first great improvement by cutting three slits instead of one, which gave an immediate impetus to the trade. Then by the introduction of machinery he greatly reduced the price, and by successive minor improvements made his pens still more popular, until he was able to build a large factory in Birmingham, and they were sold all over the world. The price of one steel pen when he entered business would buy 900 at the time of his death. His works now use five tons of steel weekly, and make 150,000,000 pens annually. Gillott acquired immense wealth, and was a connoisseur in the fine arts, having a celebrated gallery of paintings at his country residence, near Edgbaston.

GILLRAY, James, an English engraver and caricaturist, born in Chelsea about 1757, died in London, June 1, 1815. He was the son of a Chelsea pensioner, studied in the royal academy, and about 1784 became known as a successful engraver. Between 1779 and 1811 he published 1,200 caricatures, many of which were etched at once upon the copper without the assistance of drawings. The royal family and prominent cabinet ministers and politicians of the day were ridiculed by him without mercy. He died of delirium tremens. His works appeared singly, but a collection of them was published in London in 1830; an edition edited by Bohn in 1851; and a new and complete edition, with a "History of his Life and Times," by Thomas Wright, in 1874.

GILMAN, Chandler Robbins, an American physician, born at Marietta, Ohio, Sept. 6, 1802, died at Middletown, Conn., Sept. 26, 1865. During his childhood his father removed to Philadelphia. He took the degree of M. D. in 1824 at the university of Pennsylvania, and soon afterward removed to New York, where the whole of his active professional life was spent. In 1840 he was appointed professor of obstetrics and the diseases of women and children in the college of physicians and surgeons, to which was added in 1851 the subject of medical jurisprudence. In this chair Prof. Gilman continued until his death, although for the last year or two he was incapacitated by failing health. His principal publications were: a translation, prepared with the assistance of Dr. Theodore Tellkamp, of Bischoff's monograph "On the Periodical Discharge of the Ovum" (New York, 1847); "On the Relations of the Medical to the Legal Profession" (1856); and an edition of Beck's "Medical Jurisprudence" (Philadelphia, 1860).

GILMAN, John Taylor, an American statesman, born in Exeter, N. H., Dec. 19, 1753, died there, Sept. 1, 1828. On the morning after the news of the battle of Lexington and Concord reached Exeter, he marched with 100 other volunteers to Cambridge, Mass., where he served in the provincial army. Soon after,

his father being made treasurer of the state, he became his assistant in the office. In 1780 he was a delegate from New Hampshire to the convention which met at Hartford to take measures for the defence of the country. In 1782 and 1783 he was a member of the continental congress, and in the latter year succeeded his father as treasurer of New Hampshire. He was one of the three commissioners appointed by the government of the old confederation to settle the accounts of the states. In 1797 he was chosen governor, was annually reelected for 10 successive years, and again in 1813, '14, and '15, after which he declined to be a candidate. He was a zealous federalist, and his popularity in New Hampshire was so great that he was frequently chosen governor when his party was in the minority.

GILMAN. I. Samuel, an American clergyman, born in Gloucester, Mass., Feb. 16, 1791, died in Kingston, Mass., Feb. 9, 1858. He graduated at Harvard college in 1811, studied theology, and was tutor in mathematics at Cambridge from 1817 to 1819, when he married Miss Caroline Howard, and was ordained pastor of the Unitarian church in Charleston, S. C., in which office he remained till his death. He contributed many papers to reviews and other periodicals, on subjects connected with philosophy and general literature, and in 1856 published in Boston a volume of "Contributions to Literature, Descriptive, Critical, and Humorous, Biographical, Philosophical, and Poetical." His other prose works are the "Memoirs of a New England Village Choir" (1829), of which three editions were issued, and the "Pleasures and Pains of a Student's Life" (1852). He translated the satires of Boileau, and published some original poems, among which are the "History of a Ray of Light," and a poem read before the Phi Beta Kappa society of Harvard college. In Charleston he took a prominent part in promoting the temperance cause, as well as the interests of literature.

GILMAN. II. Caroline, an American authoress, wife of the preceding, born in Boston, Oct. 8, 1794. She is a daughter of Samuel Howard of Boston. At the age of 16 she wrote a poem entitled "Jephthah's Rash Vow," and soon after another on "Jairus's Daughter," which was published in the "North American Review." In 1819 she married the Rev. Samuel Gilman, and removed with him to Charleston, S. C. She has published "Recollections of a New England Housekeeper," "Recollections of a Southern Matron," "Ruth Raymond, or Love's Progress," "Poetry of Travelling in the United States," "Verses of a Lifetime," "Mrs. Gilman's Gift Book," "Oracles from the Poets" (1854), "The Sibyl, or New Oracles from the Poets" (1854), and "Stories and Poems by a Mother and Daughter" (1872). Since the civil war she has resided in Cambridge, Mass.

GILMER. I. A. N. W. central county of West Virginia, watered by Little Kanawha river; area, 512 sq. m.; pop. in 1870, 4,338, of whom

27 were colored. It has a rough surface, much of which is thickly wooded, and a rich soil, suitable for grain and pasturage. There are several salt springs and iron mines. The chief productions in 1870 were 9,830 bushels of wheat, 106,036 of Indian corn, 17,592 of oats, 44,929 lbs. of butter, and 1,636 tons of hay. There were 1,114 horses, 1,295 milch cows, 1,697 other cattle, 6,100 sheep, and 3,907 swine. Capital, Glenville. **II.** A N. county of Georgia, drained by Coosawattee and other rivers; area, about 500 sq. m.; pop. in 1870, 6,644, of whom 117 were colored. Several spurs of the Blue Ridge, abounding in beautiful scenery, and alternating with fertile valleys, traverse parts of the county. The mineral products, comprising gold, marble, and iron, are valuable and abundant. The chief productions in 1870 were 8,103 bushels of wheat, 10,417 of rye, 169,099 of Indian corn, 12,833 of oats, 13,546 of sweet potatoes, and 67,128 lbs. of butter. There were 764 horses, 1,922 milch cows, 3,369 other cattle, 6,461 sheep, and 10,701 swine. Capital, Ellijay.

GILOLO, or **Halmahera**, an island of the Indian archipelago, in the Molucca group, between Celebes and New Guinea, separated from the former by the Molucca passage and from the latter by Gilolo strait; area, about 5,780 sq. m.; pop. estimated at 27,000. It is crossed by the equator, and lies between lat. 2° 30' N. and 1° S., and lon. 127° and 129° E. The outline somewhat resembles that of Celebes. The island consists of four peninsulas radiating from a centre situated in about lat. 0° 40' N. Of these peninsulas two trend N. and S. respectively, along or near the 128th meridian; one extends toward the N. E.; and the fourth stretches to the S. E., terminating in Cape Tabo, the most easterly point of the island. The length of Gilolo is nearly 250 m. The range of smaller islands to which the name *Moluccas* was originally applied, including Ternate, Tidore, Morty, Makian, and Batchian, skirts the southerly part of the W. coast. Gilolo is of volcanic formation. From the sea coast, which is itself described as in many parts mountainous, lofty mountains are visible in the interior, some of which are said to be volcanoes. According to Wallace, the surface seems to have undergone changes of elevation within a recent period; and the upheaval of a mountain at Gamakonora in the northern peninsula is reported to have occurred in 1673. Fringes of coral reef interfere with navigation along many portions of the coast. The inland regions are but very slightly known; they appear to consist largely of elevated tracts of forest. The clove tree is indigenous to the island. About four fifths of the inhabitants are ruled by the sultan of Ternate, whose residence was formerly at the town of Gilolo, on the W. coast of the northern peninsula. The Malay element predominates, but the active and energetic inhabitants of the northern peninsula belong to an indigenous race called *Alfuros*, differing

both from the Malays and the Papuans, yet possessing some of the characteristics of each. The government of the Netherlands maintains an insignificant military station at Dodingo, a village opposite Ternate. The principal products of Gilolo are sage, spices, tortoise shell, and tropical fruits.

GILPIN, a N. central county of Colorado, lying chiefly in the foot hills; area, about 150 sq. m.; pop. in 1870, 5,490. The average altitude of the county is about 9,000 ft., but the climate is mild. The surface is broken by mountain ranges. The valleys, watered by small streams, are fertile. It is one of the richest gold-mining regions in the world, and contains more than 90 quartz mills. In 1870 it produced bullion to the value of about \$2,000,000. There are 9 hotels, 6 churches, 5 schools, 2 founderies, 2 smelting works, 1 chlorine reduction establishment, and 2 newspapers. The chief agricultural productions in 1870 were 21,665 bushels of potatoes and 172 tons of hay. Capital, Central City.

GILPIN, **Bernard**, an English ecclesiastic, born in Kentmere, Westmoreland, in 1517, died in Houghton, Durham, in 1583. He was educated at Oxford, became a convert to Protestantism after a disputation with Peter Martyr, and in 1552 was made vicar of Norton in the diocese of Durham. On the accession of Mary he went abroad for three years. On his return his uncle, Dr. Tunstall, bishop of Durham, appointed him his archdeacon, and gave him the living of Houghton, of which he remained rector till his death, declining the bishopric of Carlisle, which was offered to him by Queen Elizabeth. His parish and the neighboring neglected parishes, which he regularly visited, comprised a wild rugged district on the Scottish border, whose inhabitants, from centuries of marauding warfare, were in a half savage state. He went fearlessly among them, and by his preaching and benevolence acquired great influence over them. He preached so boldly against the vices of the times, and especially of the clergy, that complaints were made against him successively to the bishop of Durham and the bishop of London. He built and endowed a grammar school in his parish for the instruction of the children of the poor, and regularly educated at his own house 24 lads of promise whom he ultimately sent to the university. His life has been written by George Carleton (London, 1628), and by William Gilpin (London, 1751).

GIN, or **Geneva** (Fr. *genièvre*, juniper), an alcoholic liquor, distilled generally from rye and barley and flavored with juniper. It was made originally in Holland, whence it is sometimes called "hollanda," and it is still manufactured largely at Schiedam, Gouda, and Amsterdam. In the distilleries of Schiedam two parts of unmalted Riga rye are used to one part of malted bigg or barley. This is mashed with water, at a temperature of from 162° to 168°, in the proportion of 36 gallons to every

1½ cwt. of meal. When the magma has been made uniform by stirring, the tun is covered to confine the heat, and it is left thus for two hours. It is then stirred up again, the transparent spent wash of a preceding mashing is added, and afterward cold water enough to reduce the temperature to 85°. Flanders yeast is introduced next, in the proportion of 1 lb. to every 100 gallons of the mixture. Fermentation speedily sets in, and the attenuation is complete in from 48 to 60 hours. A part of the yeast is usually skimmed off from the fermenting tun, by which the production of spirit is obstructed, but the quality of the liquor is improved by preventing its impregnation with yeasty particles. The wash and grains are then transferred to the still and converted into low wine, into every 100 gallons of which are put two pounds of juniper berries and about a quarter of a pound of salt. The whole is then put into the low-wine still and the spirit drawn off by a well regulated heat. The quantity of spirit varies from 18 to 21 gallons to the quarter of grain. There are 800 distilleries of this liquor at Schiedam. English gin, manufactured largely in London and other places in Great Britain, is made usually from the impure products of the distillation of Scotch and English whiskey, rectified by one or more distillations, and flavored with various substances, such as the oil of turpentine, oil of juniper, coriander seeds, cardamoms, capsicum, &c. This gin is the common alcoholic drink of the lower classes in England, and almost every London dealer has his private receipt for increasing its pungency and strength. It is adulterated probably more than any other liquor. Pure gin contains, according to Brande, 51.60 parts of alcohol in every 100 parts.

GINDELY, Anton, a German historian, born in Prague, Sept. 8, 1829. He became in 1853 professor of the German language and literature at the Bohemian *Oberrealschule* in Prague, and in 1862 of Austrian history in the university of that city and archivist of Bohemia. He has published many historical works, including *Rudolf II. und seine Zeit* (2 vols., Prague, 1862-'5), *Monumenta Historiæ Bohemica* (4 parts, 1864-'7), and *Geschichte des Dreissig-jährigen Kriegs* (1869).

GINGER, the scraped and dried rhizoma of *zingiber officinale*, a plant of the order *zingiberaceæ*, a native of Hindostan, but cultivated both in the East and West Indies, and in Sierra Leone. It has a tuberous root, an annual stem 2 or 3 ft. high, and smooth, lanceolate leaves, 5 or 6 in. long. Its flowers are yellowish and emit an aromatic odor. Its medicinal virtues reside in its root, of which two varieties are found in the market, the black and the white or Jamaica ginger. The difference is chiefly in the retention or removal of the epidermis, and perhaps a subsequent bleaching process applied to the lighter variety. In commerce the whole ginger is called race ginger. A preserve is made by boiling the young and

tender roots in sugar; large quantities of it are imported from China. Ginger is used both for cooking and as a medicine. Its odor is aromatic and characteristic, its taste spicy and pungent. It contains a volatile oil and resins, with other constituents of less importance, and enters into

Ginger (*Zingiber officinale*).

many officinal preparations, its virtues being usually extracted by alcohol; but an infusion may be used. The popular aromatic stimulant sold as extract of Jamaica ginger is a concentrated alcoholic tincture. Ginger is a grateful stimulant and carminative, and is chiefly used either alone or in combination in disorders of the alimentary canal. It will often relieve flatulence and the griping pains of a mild colic. It renders bitter infusions and tinctures more acceptable to the stomach, and may be advantageously combined with tonic powders. In many cases it palliates, if it does not allay, the distress of seasickness. The dose of the powder is 10 grs. or more; the fluid extract and tincture are the best form for administration.

GINGKO (*Salisburia adiantifolia*), a large tree from China and Japan, belonging to the yew suborder of *conifera*. No tree can appear less like a member of the pine family than the ginkgo; it is a rapid grower, with a straight trunk clothed with a light gray bark; its deciduous leaves are alternate, fan-shaped or wedge-shaped, with the broad apex notched or cut more or less deeply, frequently two-lobed, thick and leathery, with fine longitudinal ribs, and of a light yellowish green color. The leaves are so like those of some maiden-hair ferns that it is by some called the maiden-hair tree. The staminate and pistillate flowers are borne upon separate trees; the former are in slender catkins about 1½ inch long, while the female flowers are either solitary or in small clusters at the ends of the branches; the female flower, which consists only of a naked ovule, is seated in a small cup-like disk; this increases

in size and covers the base of the ripe fruit, which is a globular or ovate nut. In its native countries the ginkgo attains a large size; Bunge mentions one 40 ft. in circumference and still vigorous; a specimen in the botanic garden at Pisa is 75 ft. high. It is supposed that it was introduced into Europe from Japan by the Dutch; it was first planted in this country in 1784 by Mr. Alexander Hamilton, who lived near Philadelphia; the trees are still standing, though the grounds have been converted into a rural cemetery; there are also some fine specimens in Boston. The wood is of a yellowish color without any resinous qualities, and useful as lumber, though the Chinese cultivate the tree mainly for its nuts, which are edible but insipid; medicinal virtues are attributed to them, and they are considered essential, roasted or boiled, at entertainments. Though the tree was for many years regarded as a great rarity in the United States, it is now not uncommon in cultivation, and is used in the ornamentation of lawns and pleasure grounds; it

Ginkgo (*Salisburia adiantifolia*).

should be planted where the peculiarity of its foliage can be readily observed. By frequently heading back the branches, it can, if desired, be kept in the form of a large bush. As it is perfectly hardy at Boston, it will probably endure the climate in most parts of the country. It is raised from seeds, cuttings, and layers; it has not fruited to any great extent in this country, but has done so abundantly, in Europe, and the seeds are imported by seed dealers. Cuttings of the old wood or of the partly ripened new wood take root readily, as do layers. Trees grown from cuttings and layers are not likely to be so well shaped as those obtained from seed. Ginkgo is one of the Chinese names for the tree, and was adopted by Linnæus as the generic name; he described it in 1771 as *gingko biloba*, but Sir James Edward Smith, considering the name "uncouth and barba-

rous," in 1796 altered it to *Salisburia*, in honor of R. A. Salisbury, an English botanist; the specific name recognizes the resemblance of the leaves to the fronds of *adiantum*, the maid-hair fern. Although this change of name was against the rules of scientific nomenclature, and strongly protested against at the time, later botanists have generally adopted it.

GINGRAS, a N. E. co. of Dakota territory, recently formed, and not included in the census of 1870; area, about 1,450 sq. m. Dakota or James river rises here, and Cheyenne river flows through the N. part.

GINGUENÉ, Pierre Louis, a French historian, born in Rennes, April 25, 1748, died in Paris, Nov. 16, 1816. He went to Paris in 1772, being then acquainted with classical, French, Italian, and English literature, and music. He had written before leaving Rennes a poem entitled *La confession de Zulmé*. He showed it to many of his friends, copies were taken, and in 1777 it was published without his consent and disfigured by innumerable errors. Several persons claimed the authorship, and he finally published it correctly under his own name in 1779. He afterward published several other poems. In 1776 the celebrated composer Piccini arrived in Paris, and soon after a violent quarrel broke out between his admirers and those of Gluck, in which Ginguéné was the most effective supporter of Piccini's cause. About 1780 he obtained a clerkship in the office of the minister of finance. The moderation of his views brought upon him the hostility of the revolutionists, and in 1793 he was thrown into prison, and only released on the overthrow of Robespierre. He was soon after appointed a member of the executive commission of public instruction, and was director general of that branch of the administration from 1795 to 1797. In 1794, in company with Chamfort, he commenced the *Décade philosophique littéraire et politique*. After the abolition of the republican calendar the title was changed to *Revue*, and he continued to write for it till 1807, when it was merged in the *Mercur de France*. In 1798 he went to Turin as minister plenipotentiary, but remained only seven months. In 1799 he was chosen a member of the tribunate. His course there, especially his opposition to special tribunals, excited the anger of Bonaparte, and he was removed from the office in 1802. In 1802-'8 and 1805-'6 he delivered lectures on Italian literature at the athenæum of Paris, which attracted crowded audiences, including a large number of the most distinguished literary men of France. He was a member of the commission established to continue the *Histoire littéraire de la France*, of which 12 volumes had been completed by the Benedictines; to the succeeding volumes he contributed many articles, mostly on the lives and productions of the troubadours. He also wrote much for the *Biographie universelle* and the *Moniteur*. But his great work is the *His-*

toire littéraire d'Italie (9 vols., 1811-'19). A small portion of the 7th volume and about half of the 8th and 9th were written by Francesco Salfi, who added a 10th entirely his own, bringing it down to the close of the 18th century. This work was received with great favor all over Europe, and especially in Italy, where many editions and translations of it have been published. A second edition (14 vols., Paris, 1824-'85) was published under the supervision of Daunou.

GINSENG, the root of the perennial herb formerly called *panax quinquefolium*, but now placed in the genus *aralia*. The Chinese ginseng is probably derived from another species of the same genus. The root of the plant growing in the United States is of interest or value chiefly as an article of exportation to China, where it is supposed to possess remarkable virtues in the treatment of nearly all diseases. The fleshy root, from 4 to 9 in. long, throws up a



Ginseng (*Aralia quinquefolia*).

simple stem about a foot high, which bears at the top three long-petioled leaves, each of which has five divisions, and a small umbel of inconspicuous, greenish white flowers, which are succeeded by small berry-like red fruits. Before the introduction of the American root, ginseng is said to have brought its weight in gold at Peking. There is no reason to suppose its efficacy is other than imaginary. It is chewed by some persons in this country, but is not used in medicine, except as a demulcent.

GIOBERTI, Giovanni Antonio, an Italian chemist, born at Mangardino, Piedmont, Oct. 28, 1761, died Sept. 14, 1834. He introduced the principles of Lavoisier into Italy; in 1790 became perpetual secretary of the society of agriculture at Turin, in which science he effected great improvements; was a member of the provisional government established by the French in 1798, and was imprisoned by the Austrians in 1799. In 1800 he was made professor in the university of Turin. The Giober-

tine tincture, discovered by him, is a preparation for restoring ancient writings which have become illegible, either from the fading of the ink, or from the partial washing away of the original writing to make room for another. It was found that by the application of diluted muriatic acid and of prussiate of potash to the parchment previously moistened in water, the oldest and most faded MS. was almost wholly restored. (See **PALIMPSEST**.)

GIOBERTI, Vincenzo, an Italian philosopher, born in Turin, April 5, 1801, died in Paris, Oct. 26, 1852. He studied at the university of Turin, and in 1825 was ordained priest. Becoming professor of theology at Turin, he spent several years in scholastic retirement. Religion and patriotism were the twin motives with which he inspired his pupils. On the accession of Charles Albert he was appointed court chaplain, but resigned the office in 1833. This step and the liberal tone of his university lectures made him suspected as an accomplice of the revolutionary schemes of "young Italy," and he was suddenly arrested. Although no direct connection with the "young Italy" societies was proved, he was sentenced to four months' imprisonment and to banishment. The first year of his exile he spent in Paris, for the purpose of pursuing his studies in philosophy. He then went to Brussels, where he occupied for eleven years a humble position as teacher in a private school. He resumed his interrupted studies, and produced his philosophical works, the *Teoria del sovranaturale* (Brussels, 1838), and the *Introduzioni allo studio della filosofia* (2 vols., Brussels, 1840). The mastery displayed in the latter work at once of the highest problems of theology, philosophy, and history, its profound expositions and hostile criticisms of the principal modern philosophical systems, and its brilliant and novel subjection of science to revelation, and of all the culture of life to religion, caused him to be immediately recognized as one of the chiefs of Catholic philosophy. It was rather by the remarkably original form of its statements than by the novelty of its ideas that the *Introduzioni* exerted its influence, and caused Gioberti to be hailed as the reconstructor of modern philosophy. It was quoted with applause in the charges of French and Italian bishops, and, though assailed by a portion of the Catholic press, was examined, judged, and commended by Pope Gregory XVI. Eloquent, passionate, and full of bold and felicitous digressions, it contains more pages on literature, art, and especially politics, than on the philosophical theory which it introduces. In his work *Del bello* (Brussels, 1841) he applied his philosophy to aesthetics. The first work that made him popularly known was the *Del primato morale e civile degli Italiani* (Brussels, 1843), whose object was to restore in Italy not only the philosophy of the Christian fathers but the Guelph policy of the papacy. Italy, he maintains, is the sacerdotal nation of Ro-

man Catholic Europe, being elected by Providence to guard the second dispensation, as Israel was to guard the first. He affirms that the priesthood has attempted to retain the people in tutelage beyond the proper time, after it has lost its former moral and intellectual superiority over them. Hence a fatal schism exists between the ecclesiastical and temporal orders, between spiritual and secular culture, which is the source of all the evils that afflict modern society. He proposes a voluntary cession by the priesthood of a dominion which has become incompatible with modern civilization, and a thorough alliance of sacerdotal and lay culture. He calls upon the Italians and the Italian clergy to inaugurate this new civilization, urging the latter to put themselves at the head of social movements, and to be the champions and not the enemies of the demands of the age for free institutions. He claims for the pope an arbitratorship in the affairs of the European nations, founded on his spiritual authority. The programme which he proposed for immediate Italian politics was: a confederation of the states; the introduction of reforms; a religious head, the pope; a military head, the king of Sardinia; a capital, Rome; a citadel, Turin; and above all, a sentiment of nationality in the Italian princes. From the publication of the *Primato*, Gioberti was regarded as the leader of the moderate liberal party. Few works have been received with greater enthusiasm, or have wrought a greater influence upon the public opinion of a nation. It was, however, distrusted by the Jesuits, to whom Gioberti replied in the *Prolegomeni* of the second edition (Brussels, 1845). In 1846 he removed to Paris. The accession of Pius IX., who had studied with favor the writings of the exiled philosopher, and the liberal measures which he granted at the same time that constitutional principles were proclaimed by the court of Turin, promised to Gioberti the speedy realization of his ideal. He wrote a severe and passionate answer to the attacks of the Jesuits, under the title of *Il Gesuita moderno* (5 vols., Lausanne, 1847), which was followed by their expulsion from Sardinia. At the revolution of 1848 he returned to Italy after an absence of 15 years, and Turin was illuminated in his honor several nights in succession. He advocated a union of the states under the supremacy of the house of Savoy, and he visited the principal cities of the peninsula, haranguing the troops, the universities, and the populace, and was everywhere received with enthusiasm. But Mazzini, the head of "young Italy," was his rival in popularity and his bitter opponent; and discord prevailed also among the princes, some of whom withdrew the forces which they had sent to aid Sardinia against Austria. Gioberti, elected to the Piedmontese parliament (which assembled on May 8) by both Genoa and Turin, placed himself at the head of the constitutional royalist party in the chamber of deputies, and was ap-

pointed its president by acclamation. In July he entered the Casati ministry, which after the military reverses of Charles Albert gave place to that of Revel, which accepted an armistice that resembled an abandonment of the war of independence, and therefore was at once unpopular. Gioberti united with his opponents of the extreme democratic party in efforts to overthrow this ministry, and at the same time resumed his idea of a political league, and became president of the society for an Italian confederation, representatives of which from all parts of Italy assembled in Turin in October. His conduct won general admiration, even from "young Italy," and he was enthusiastically placed at the head of the cabinet which in December succeeded that of Revel. Though he had announced a new campaign in Lombardy, he was convinced that it could only be fruitless, and broke with the party which had yielded to him and shared with him the ministry, absorbed in himself all the energy and responsibility of the cabinet, and, renouncing the war of independence, resolved to employ the Piedmontese armies in restoring the thrones of the peninsula which had been carried away by the popular commotions. He designed to surround them with constitutional guarantees, and to make them not less liberal than anti-republican. Two obstacles prevented his beginning the execution of the plan: the refusal of the Italian princes to trust their restoration to the court of Turin, and the energetic resistance of the other Piedmontese ministers to such a movement. The king himself formally opposed the programme, and Gioberti resigned his office on Feb. 21, 1849, declaring that with him had fallen the cause of Italian renovation. After the disaster of Novara (March 23), he entered the new cabinet as minister without a portfolio, and was soon after sent to Paris as plenipotentiary. The mission being hardly more than an honorable exile, he solicited the appointment of a successor, and retired from public life. He resumed his studies, and published his *Del rinnovamento civile d'Italia* (3 vols., Paris and Turin, 1851), in which he criticises the conduct of parties in the movement of 1848, and affirms that he repents of no counsel which he gave or political act which he performed during his public career. The end of his efforts he declares to have been "to establish in Italy a Piedmontese hegemony, and in Europe the moral supremacy of Italy." He resided from this time in Paris, and was engaged in a philosophical work on *Protologia*, or first science, when his death occurred suddenly by apoplexy. Gioberti refused to submit to the papal condemnation of his *Gesuita moderno*, and all his works have been placed on the index at Rome. Besides those already mentioned, he wrote letters in French *Sur les erreurs religieuses de M. de Lamennais* (Brussels, 1840), and *Sur les doctrines philosophiques et politiques de M. de Lamennais* (1842), and a treatise *Degli errori filosofici di Ant. Rosmini* (1841),

charging both of these philosophers with tendencies to pantheism; *Del buono* (1848), in which he applies his philosophical system to ethics; *Apologia del libro intitolato Il Gesuita moderno* (Paris and Brussels, 1848); and *Opere politiche* (2 vols., Lugano, 1851). A uniform edition of his earlier works was published at Brussels (9 vols., 1843-'5). The edition of his posthumous works, edited by G. Massari (Paris and Turin, 1856), has never been completed.

GIOCONDO, or *Jocundus*, *Fra Giovanni*, an Italian architect, born in Verona about 1450, died in Rome about 1530. He was a Dominican friar, studied archaeology in Rome, and collected in that city upward of 2,000 ancient inscriptions, which he presented to Lorenzo de' Medici. He designed the fortifications of Treviso, saved the lagoons of Venice from inundation by diverting the waters to the sea near Chioggia, and in 1494-'8 was architect to the emperor Maximilian at Verona, where he built the palace of the council and the church of Sta. Maria della Scale. In 1500-'7 he was employed by Louis XII. in building the bridges (since restored) of Notre Dame and of the Hôtel Dieu. He afterward constructed in Venice a great warehouse on the rialto, known as the Fondaco de' Tedeschi, for which Titian and Giorgione made decorations; but the greater part of it being destroyed by fire in 1514, he left Venice because the authorities, instead of permitting him to rebuild it in stone, ordered another structure of wood by an inferior architect. Bramante dying in the same year, Giocondo was appointed by the pope to succeed him as architect of St. Peter's, and labored on that grand edifice simultaneously with Raphael. He instructed Scaliger in Latin and Greek, and was proficient in philosophy, theology, and classical literature. Having been the first to prepare a design of Julius Cæsar's bridge across the Rhine, he wrote notes on the latter's "Commentaries," which were issued in 1517 by Aldus Manutius the elder, who also published (1508-'14) Pliny's correspondence with Trajan, which Giocondo had discovered while in Paris.

GIOJA, or *Gioja del Colle*, a town of Italy, in the province of Bari, situated on the crest of the E. branch of the Apennines, on the road from Bari to Taranto, 18 m. E. by S. of Altamura; pop. in 1862, 17,005. It derives great prosperity from the rich local products of cereals and oil. The outskirts were in former times covered with woods, which the emperor Frederick II. enclosed for a park.—There is also a town of Gioja on the W. coast of Calabria, which gives its name to a gulf.

GIOJA, Flavio. See COMPASS, vol. v., p. 186.

GIOJA, Melchiorre, an Italian political economist, born in Piacenza, Sept. 20, 1767, died in Milan, Jan. 2, 1829. He studied in his native city at the college Alberoni, and received holy orders. He lived in retirement till the changes caused in Italy by the victories of Napoleon. The institute of the Cisalpine republic

having proposed the question, "Which of all free governments is the best for Italy?" he answered, "The republican," in a dissertation which obtained the prize. He was subsequently appointed historiographer of the state. His liberal views caused him a temporary imprisonment in 1799. Having lost his situation as historiographer by a treatise on divorce (1803), and been removed from the board of statistics on account of articles criticising the management of public affairs, he revenged himself by a sarcastic article entitled *Il povero diavolo*, in consequence of which he was obliged to leave Italy. He was recalled after some years, and intrusted with the elaboration of the statistics of the kingdom of Italy. Suspected of participation in the liberal movements of 1820, he was arrested by the Austrian government, but set free after eight months' imprisonment. He was a disciple of Bentham and Locke, and his numerous works on political economy are among the best in the Italian language.

GIORDANO, *Luca*, an Italian painter, born in Naples in 1632, died there, Jan. 12, 1705. He studied at first under Ribera, and afterward went to Rome and studied under Pietro da Cortona. He painted with unequalled rapidity; which circumstance, as well as his nickname of *Fa Presto*, was perhaps due to the avarice of his father, an inferior artist, who in Luca's youth sold his works at a high price, and was continually urging him on with the words, *Luca, fa presto* ("Luca, make haste"). He visited Parma, Venice, Bologna, and Florence, leaving everywhere products of his talent and facility. Invited to Madrid by Charles II., he remained in Spain a number of years, and executed an immense number of frescoes in the Escorial, and in the churches and palaces of Madrid, Toledo, &c. The skill with which he imitated the manner of other artists gained him the title of the Proteus of painting. Among the most admired of his numerous works are the "Triumph of the Church Militant" in the Escorial, the "Virgin and the Child Jesus" in the Pitti palace at Florence, and the "Judgment of Paris" in the Louvre.

GIORGIONE (*GIORGIO BARBARELLI*), one of the founders of the Venetian school of colorists, born at Castelfranco, near Treviso, in 1477, died of the plague in 1511. He was called Giorgione, according to Lanzi, from a certain grandeur conferred upon him by nature, no less of mind than of form. He was educated in the school of the Bellini at Venice, where Titian was one of his fellow students; but following the bent of his genius, he broke away from their stiff and constrained manner, and formed a style of his own, distinguished by boldness of outline, grace and expression in the countenances as well as the motions of his figures, well graduated and rich coloring, and effective chiaroscuro. The last of these he probably acquired by studying the works of Leonardo da Vinci, although he approaches the style of Correggio more nearly than that

of any other Italian painter. Giorgione's works in fresco, of which he executed many on the façades of Venetian palaces, are almost entirely obliterated, but his portraits in oil, among the most admirable ever painted, and remarkable for the warmth of their coloring, particularly in the flesh tints, as well as their grace and animated expression, are in good preservation, although they are not numerous. Of his historical paintings, the "Moses rescued from the Nile," in the Pitti palace at Florence, is esteemed his *chef d'œuvre*.

GIOTTO, called also **GIOTTO DI BONDONE** from his father, and by some **AMBROGIOTTO**, the regenerator of Italian art, born at Vespignano, near Florence, in 1276, died in the latter place about 1337. Tradition relates that the painter Cimabue discovered him, a shepherd boy in the valley of Vespignano, in the act of drawing upon a smooth piece of slate the figure of a sheep grazing near him, and was so struck with the genius which the work evinced that he took him into his own house in Florence and taught him his art. Giotto speedily excelled his master, who undoubtedly at the close of his life conformed his style to that of his pupil. Art was then feebly struggling to free itself from the trammels of the Byzantine style. Cimabue and Duccio di Siena had indeed attempted to improve on existing models, but Giotto rejected them altogether. The symbolic representation of a subject, according to conventional rules, had hitherto been the highest aim of the artist. Giotto first gave life to art by making his works truly reflect nature. From the remoteness of the epoch in which he painted, it is not surprising that many of his works have perished; but from the specimens that remain and the traditions of those that are lost it is easy to account for his influence over central Italy, from Padua to Naples. Social and political revolutions, the quality of the materials used, the effects of climate, and the vandalism of his own and of later times, have destroyed or hopelessly injured his choicest works. Some of them have been whitewashed over, among them his portraits of Dante and other eminent citizens of Florence, one of his earliest works painted on the walls of the chapel of the Podestà, now the Bargello or prison in Florence, which Mr. Richard H. Wilde and Mr. Bezzi brought to light in 1840. These are said by Vasari to be the first successful attempts at portraiture. The record of Giotto's life is not very clear, but it is certain that before the death of Cimabue his reputation was such that Pope Boniface VIII. summoned him to Rome, where he designed his famous mosaic of the *Navicella*, representing the disciples at sea in a tempest and Christ raising Peter from the waves. It is now in St. Peter's, but frequent restorations have left little of the original work besides the composition. We next hear of him at Padua, where about 1306 he executed in the chapel of the *Madonna dell' Arena* his 42 paintings representing the life of the Virgin. He here

met his friend Dante, then exiled from Florence, to whose influence the allegorical tendency which these and many of his subsequent works exhibit is justly ascribed. An instance of this is afforded in the majestic figures of Poverty, Chastity, and Obedience, representing the three vows of the order of St. Francis, over whose tomb they are painted in the famous abbey church of the Franciscan order at Assisi, the repository of so many curious specimens of old Italian art. Robert of Naples entertained him honorably at his court, where he painted the sacraments for the Incoronata; and he is even said to have followed Clement V. to Avignon, and to have painted there and elsewhere in France. The wonder and enthusiasm which his works excited are perhaps without a parallel in the history of Italian art. A contemporary writer naively illustrates the feeling of the time by expressing his surprise that in Giotto's pictures "the personages who are in grief look melancholy, and those who are joyous look gay." Boccaccio says that "through Giotto that art was restored to light which had been for many centuries buried." Giotto excelled also in sculpture and architecture. The famous Campanile of Florence, erected in 1334, was from his designs. His school flourished for upward of a century after his death.

GIOVIO, **PAOLO** (**PAULUS JOVIUS**), an Italian Latin historian, born in Como, April 19, 1483, died in Florence, Dec. 11, 1552. He studied at Pavia, abandoned medical for historical inquiries, was protected by Popes Leo X. and Clement VII., by Charles V. and Francis I., wielded a venal pen, was loaded with honors and favors, and having lost all that he possessed when in 1527 Rome was sacked by the army of the constable of Bourbon, was rewarded with the bishopric of Nocera. His most important work is a "History of his own Time" in 45 books, 6 of which are wanting. His veracity is not to be relied on.

GIRAFFE, or *Camelopard* (*giraffa camelopardalis* of most authors; *cervus camelopardalis* of Linnaeus), an African genus of the ruminants, with persistent horns, common to both sexes, having but a single species, as above. The characteristics of this singular animal, which appears, in some particulars, to participate in the qualities of the camel, the ox, and the antelope, are these: The lip is not grooved, is entirely covered with hair, and is very much produced before the nostril; the tongue is extremely long and prehensile, capable of being protracted or retracted at will, and of being tapered so as to enter the ring of a small key; the neck is very long, the body short, hind part lower; false hoofs none; tail elongate, with a tuft of thick hair at the end. The horns constitute the principal generic characteristic, since they are of neither the bovine nor cervine form, but are in fact bones, exhibiting throughout precisely the same structure as the other bones, united to the frontal and parietal bones by a distinct suture, covered with a hairy skin,

and terminating in a ring of bristly hairs at the summit, surrounding a bare apex. These bristles, according to some naturalists, want only the gluten to cement them into true horns, and embody the animal in the systematic arrangement of the *cavicornia*. The giraffe is assimilated to the camel by the length of its neck, by the callosities on its chest and knees, and by its having no false hoofs; to the other ruminants by the structure of its stomach and digestive organs generally, and by its non-possession of the reticulated water bag. To the antelopes it is assimilated by the fact that the coils of its colon are spiral, and that its cæcum is simple. With the solid-horned deer, which shed and renew those appendages annually, it is connected by the assumed fact of its having no gall bladder. In its dental system, the giraffe offers the same formula with the deer, goat, antelope, sheep, and ox, namely: incisors $\frac{1}{2}$, canines $\frac{1}{2}$, molars $\frac{1}{2} = 32$. The nos-

es of acacia peculiar to the districts which it inhabits. The peculiar conformation of the tongue, which is furnished with rough papillæ capable of voluntary erection, enables it to gather and collect into little bundles the soft leaves which it likes. Its speed, which is far from contemptible, is shown by the statement of hunters who have pursued it, particularly Capt. Gordon Cumming; all of whom testify that, being timid and wary, and always securing a good start, it is not easily overtaken, except by a swift horse. Its paces are a trot, a pace with both legs moved on the same side, and a regular gallop, by changing from one to the other of which, with no apparent diminution of its speed, it can keep up a considerable rate of going for a long continued time and distance. Le Vaillant, the first well informed modern zoölogist who saw it in a state of nature, asserts that he "knows beyond a doubt that by its kicking it often tires out, discourages, and even beats off the lion." The same fact is shown by Capt. Cumming. Of the adaptation of the giraffe to the country and scenery he inhabits, this observant naturalist and sportsman speaks as follows: "I have often traced a remarkable resemblance between the animal and the general appearance of the locality in which it is found. . . . And as the giraffe is invariably met with among venerable forests, where innumerable blasted and weather-beaten trunks and stems occur, I have been repeatedly in doubt as to the presence of a troop of them, until I had recourse to my spy-glass; and on referring the case to my savage attendants, I have known even their optics to fail—at one time mistaking the dilapidated trunks for camelopards, and again confounding real camelopards with those aged veterans of the forest." This animal when full-grown sometimes attains a height of 15, 16, and even 17 ft. It was formerly believed almost universally that the fore legs are much longer than the hinder ones, but in fact, taking the legs only from the setting on, the hind legs are the longer by about one inch. The great development and height of the withers, to give a proper base to the long neck and towering head, have been the cause of this error. The color of the giraffe varies, both in its intensity and in the mode of its variegation. The head is generally of a uniform reddish brown; the neck, back, and sides, outside of the shoulders and thighs, are varied with large tessellated, dull, rust-colored marks of a square form, with white narrow divisions; on the sides the marks are less regular; the belly and legs are whitish, faintly spotted; the part of the tail next to the body is covered with short, smooth hair; its trunk is very slender, and toward the end the hairs are very long, black, and coarse, and form a great tuft hanging far beyond the tip of the tail. The coloring of the female is less vivid than that of the male; she is somewhat smaller, and has the peculiar protuberance of the frontal bone between the eyes, which by some writers has been called a

Giraffe (*Giraffa camelopardalis*).

trils are provided with cutaneous sphincter muscles, and can be shut at will like the eyes. The eyes are beautiful, extremely large, soft and brilliant, and are so placed that the animal can see much of what is passing on all sides and even behind it. Thus it is approached with the greatest difficulty; and if surprised or run down, it can direct the rapid storm of kicks by which it defends itself in the most accurate manner. Its horny hoofs are divided, and it wants the two small lateral toes generally seen in the true ruminants, from which this again distinguishes it. The immense length of its legs and height at the withers, raising the insertion of the neck so far from the ground that the animal can graze on an even surface only with difficulty and by straddling the fore legs wide apart, enables it to feed on what it prefers as food, the delicate and succulent leaves and twigs of the tallest trees, particularly those of a spe-

rudimental horn, less strongly developed than the male.—The giraffe has been long known to history. It is represented on the painted walls of the sekos of the Memnonium, discovered and described by Belzoni; and also on the celebrated Prænestine pavement, said to have been constructed by the orders of Sulla, who had served as *quæstor* in Numidia. It was exhibited in the *circus maximus* by Julius Cæsar, alive, for the first time in Europe, but was afterward a frequent spectacle at the cruel shows of Rome. Gordian, the third of the name, once exhibited 10 together. It continued to be known and described by travellers, but was not brought into Europe until a much later period. During the last 40 years several specimens have been seen in the zoological gardens of London and Paris, and many have been brought to this country, where they seem to thrive. In its natural, as in its domesticated state, it is gentle, timid, shy, and inoffensive; it is extremely docile in confinement, feeds from the hand, licks the hand which feeds it, and becomes the friend of those who are kind to it. Its natural range appears to be all the wooded parts of eastern, central, and southern Africa, from Sennaar and Abyssinia to the vicinity of the settlements of the Cape of Good Hope, although, like all wild animals, it recedes before the approach of civilization. In domestication it serves no purpose but to gratify curiosity and to promote the study of nature, since it is unfit for draught; and although its flesh is said by hunters to be eatable, it is not suitable for furnishing either meat or milk.

GIRALDUS CAMBRENSIS. See BARRY, GERALD.

GIRARD, Philippe de, a French inventor, born near Avignon, Feb. 1, 1775, died in Paris, Aug. 26, 1845. In 1806 he exhibited an improvement in lamps, and in the same year made some improvement in the steam engine, producing a rotary motion without a walking beam. His principal invention was a machine for flax spinning, to which subsequently he applied steam, and for which he received the emperor's medal in 1810, and another medal from the national exposition of industry in 1844. He invented several other machines, and for many years was interested in extensive manufactories of linen in Poland and in Austria, as well as in France.

GIRARD, Stephen, an American merchant and banker, born near Bordeaux, France, May 24, 1750, died in Philadelphia, Dec. 26, 1831. He was the son of a seaman, and sailed about 1760 as cabin boy to the West Indies and New York. Rising by degrees to be master and part owner of an American coasting vessel, he accumulated in the course of a few years a sum sufficient to establish him in business as a small trader in Philadelphia in 1776. He married about this time the daughter of a ship builder of that city, but the union was unhappy. Mr. Girard applied for a divorce, and his wife ultimately died insane in a public hospital. Mean-

while Girard trafficked with the West Indies with variable success, until his maritime ventures were suspended by the war of the revolution. He then opened a grocery and liquor shop, at first in Philadelphia, and during the British occupation of that city at Mount Holly, where he drove a profitable trade with the American soldiers. In 1780 he resumed his dealings with the West Indies and New Orleans, and some time afterward was in partnership for a few years with his brother John. The connection was dissolved in 1790, Stephen having gained while it lasted about \$30,000. The foundation of his subsequent wealth, however, seems to have been a lease which he took of a range of stores, at a time when rents were much depressed by the war; these he underlet at a large profit. Another source of gain was the negro insurrection in Hayti. Two of his vessels were then in one of the ports of the island, and many of the planters placed their treasures in them for safety, but were afterward cut off with their entire families. About \$50,000 worth of property whose owners could not be found thus remained in Mr. Girard's hands. With a remarkable capacity for business and a habit of strictness in money matters, he rapidly multiplied his wealth, and before long came to be recognized as one of the richest merchants in the city. During the prevalence of the yellow fever in Philadelphia in 1793, '7, and '8, when it raged with a violence never before seen in America, Mr. Girard not only gave money liberally, but performed in person the duties of physician and nurse, undertook the most disagreeable offices in the hospitals, and for two months kept charge of the hospital on Bush hill. In 1812, having purchased the building and a large part of the stock of the old United States bank, he commenced business as a private banker, with a capital of \$1,200,000, which was afterward increased to \$4,000,000. Besides the benefit which this institution proved to the national currency, it enabled Mr. Girard to make heavy loans to the government in times of public embarrassment; and during the war of 1812, when out of a loan of \$5,000,000 proposed by the secretary of the treasury only \$20,000 could be negotiated, he subscribed for the whole amount. He was active in procuring the charter of the second United States bank, of which he became a director. He contributed liberally to all public improvements, and adorned the city of Philadelphia with many handsome buildings. He was frugal and parsimonious, but not avaricious; profuse in his public charities, but stern in exacting the last fraction that was due him. His kindness to the sick was extraordinary, but he never had a friend. His appearance was very plain. He was uneducated; was a free thinker in religion, and an admirer of the school of Voltaire and Rousseau, after whom he was fond of naming his ships. His property at the time of his death

amounted to about \$2,000,000. Comparatively little of it was bequeathed to his relatives. To the Pennsylvania hospital he willed \$30,000; to the Pennsylvania institution for the deaf and dumb, \$20,000; to the orphan asylum of Philadelphia, \$10,000; to the Philadelphia public schools, \$10,000; to the city of Philadelphia, for the distribution of fuel to the poor every winter, \$10,000; to the society for the relief of distressed masters of ships, \$10,000; to the masonic loan, \$20,000; to the city of New Orleans, a large amount of real estate; to the city of Philadelphia, for improvement of its streets, buildings, &c., \$500,000; for the improvement of canal navigation in Pennsylvania, \$300,000. His principal bequest was \$2,000,000, besides the residue of a certain portion of his estate out of which some legacies were to be paid, together with a plot of ground in Philadelphia, for the erection and support of a college for orphans. The most minute directions were given for the construction, size, and materials of the building, which was begun in July, 1833, and opened Jan. 1, 1848. It is surrounded by a stone wall 10 ft. high, enclosing 41 acres laid out in play grounds, grass plats, gardens, &c. The main building is the finest specimen of Grecian architecture in America, and is even said to be the finest of modern times. The outer walls, staircases, floors, and roof are of white marble; the inner walls of brick. It is in the form of a Corinthian temple, surrounded by a portico of 24 columns, each 55 ft. high and 6 ft. in diameter. Its length is 169 ft., its width 111 ft., and its height 97 ft. The entrances are on the N. and S. fronts, each door being 16 ft. wide and 32 ft. high; the E. and W. sides are pierced each by 24 windows. The structure rests on a basement of 11 steps extending around the entire building. A marble statue in the lower vestibule covers the remains of Mr. Girard. There are five other buildings within the enclosure, one of which is used as a laboratory, bakery, wash house, &c. The others stand two on each side of the main building, and are of marble, each two stories high, 125 ft. long, and 52 ft. wide. The cost of the edifices was upward of \$1,930,000. As many poor white male orphans as the endowment can support are admitted between the ages of 6 and 10 years, fed, clothed, and educated, and between the ages of 14 and 18 are bound out to mechanical, agricultural, or commercial occupations. In a recent report the directors say that, the apprenticeship system as it existed in Mr. Girard's time having become obsolete, the execution of that part of the will is now difficult. By a provision of the will of the founder no ecclesiastic, missionary, or minister of any sect whatever, is to hold any connection with the college, or be admitted to the premises even as a visitor; but the officers of the institution are required to instruct the pupils in the purest principles of morality, leaving them to adopt their own

religious opinions. The officers consist of a president, secretary, two professors, five male and five female teachers, a physician, a matron, a steward, and a superintendent of manual labor; and there are about 500 beneficiaries.

GIRARDIN. I. Émile de, a French journalist, born in Paris, June 22, 1806. The natural son of Count Alexandre de Girardin and Mme. Dupuy, wife of a counsellor, and registered at his birth under the name of Émile de Lamothe, he struggled for years before he gained his right name, and it was not till 1837 that his filiation was definitely established by his parents' public avowal. After being inspector of the fine arts under the Martignac ministry, he established two periodicals: *Le Voleur*, which pilfered from all the other journals, and *La Mode*, a journal of fashion, which enjoyed the patronage of the duchess of Berry. After the revolution of 1830 he established the monthly *Journal des Connaissances utiles*, the price of which was only four francs (less than 80 cents) a year, which soon obtained 120,000 subscribers. Through the agency of this paper he organized a subscription for the establishment of a model farm, known as the *institut agricole de Coëtbo*, and greatly contributed to increase the number of savings banks through the country. He issued other cheap publications in connection with his monthly, as the *Journal des Instituteurs*, at 36 cents a year; a geographical atlas at one cent a map; and the *Almanach de France*, at 10 cents a copy. All these publications were issued as emanating from a *société nationale pour l'émancipation intellectuelle*. He also published the *Journal des Gardes Nationales*, and the *Gastro-nome*, a culinary paper which was found in every eating house. He was one of the founders of the illustrated weekly *Musée des Familles*. In 1835 he projected the *Panthéon Littéraire*, a series of 100 large vols. 8vo, which were to embrace a mass of letterpress equal to 1,000 ordinary volumes, and to present in a cheap form the standard works of every country. In 1836 he established the *Presse*, a political daily paper, at a yearly subscription of 40 francs, half the price before paid for such journals. This attempt brought upon him the wrath of nearly all the contemporary journalists of Paris. Both his public and private life were assailed; he was charged with claiming a name which was denied him, with dishonesty in some of his numerous business transactions, and with unscrupulous ambition in his political course. He challenged Armand Carrel, and killed him in the duel, when the clamor against him increased on all sides. But he was undaunted, and secured the full possession of his name and a seat in the chamber of deputies, which was long contested on the ground that he was not a Frenchman, but, as was falsely reported, a native of Switzerland, while he extended the circulation of the *Presse* so as to place it beyond rivalry. He supported the Molé ministry against the coalition in 1839,

and the ministry of Guizot during most of its duration. On Feb. 24, 1848, he presented himself at the Tuileries and persuaded Louis Philippe to an abdication in favor of his grandson, the count de Paris; but it was too late to save the dynasty. He vigorously supported the new order of things, tried to inspire the French people with confidence in it, and became for a while the most popular journalist in Paris. During a few weeks nearly 150,000 copies of the *Presse* were disposed of daily. His independent politics were deemed dangerous by Gen. Oaavaignac, who ordered his arrest after the insurrection of June, and kept him 11 days in strict confinement. On resuming the charge of his journal, Girardin vehemently attacked the rule of the general, and greatly contributed to the election of Louis Napoleon to the presidency, but soon became his opponent, gave his journal a more and more radical and socialistic turn, and after the *coup d'état* of Dec. 2, 1851, was ordered out of France. He afterward returned, but, unable to submit to the restrictions on journalism, sold his share in the *Presse* in 1856 for 800,000 francs. In December, 1862, he again became its chief editor, but he finally abandoned it in 1866, and established *La Liberté*. He attacked the administration vigorously, and in March, 1867, was fined 5,000 francs, and a month later the sale of his journal on the street was prohibited. He still continued to attack the administration, subjecting himself to further prosecution, and he also severely criticised the course of many of the opposition journals. After the formation of the Ollivier ministry (Jan. 2, 1870) he accepted several government commissions. After the proclamation of the republic (Sept. 4) an unpublished decree, bearing date July 27 and countersigned by Émile Ollivier, was found among the papers of the Tuileries, conferring upon Girardin the rank of senator. About the same time he sold *La Liberté* for 1,000,000 francs, and for a time withdrew from journalism. But he soon resumed his pen, and became a vehement supporter of the war against Prussia. During the siege of Paris *La Liberté* was transferred to the country, and he followed it, and on Dec. 24 purchased *Les Cents Jours*, in which he severely criticised the dictatorship of M. Gambetta. During the insurrection of the communists he published a journal called *L'Union Française*, in which he advocated the adoption of a federal system of government. In May, 1872, he purchased the *Journal Officiel*, whose management, however, was retained by its former conductor. The catalogue of his political pamphlets would fill columns. His contributions to the *Presse* from 1836 to 1856 were published in 1858 (12 vols. 8vo), under the title of *Questions de mon temps*. In 1859 he furnished a preface to a work entitled *Les bêtards célèbres*, by A. Chagnérand. His *Du droit de punir* (Paris, 1871), on which he was engaged for ten years, is mainly a supplement to Beccaria's *De delitti e delle pene*.

In opposition to *L'Homme-femme*, by Alexandre Dumas fils, he published in 1872 *L'Homme et la femme, l'homme suzerain, la femme vassale*. After the death of his first wife he married (November, 1856) Countess Mina de Tieffenbach, daughter of a former Viennese postmaster, and widow, by morganatic marriage, of Prince Frederick of Nassau. He obtained a divorce from her in 1872. II. **Delphine Gay**, a French authoress, wife of the preceding, born in Aix-la-Chapelle, Jan. 26, 1804, died in Paris, June 29, 1855. She was the daughter of Mme. Sophie Gay, and a poem written by her when scarcely 18 years old gained an extraordinary prize of the French academy. In 1824 she published a collection of *Essais poétiques*. She was accustomed to recite her verses in society, and having extemporized some beautiful lines on the premature death of Gen. Foy in 1825, she was hailed as *la muse de la patrie*, and received from Charles X. a pension of 1,500 francs. On a visit to Italy in 1827 she was elected by acclamation a member of the Tiber academy at Rome, and carried in triumph to the capitol. She married Émile de Girardin in 1831, and produced in 1833 *Napoline*, one of her most charming poems. She had already begun to write novels. *Le lorgnon* appeared in 1831, and was succeeded by *M. le marquis de Pontanges* in 1835, and *La canne de M. de Baleac* in 1836. From 1836 to 1848 she furnished to the *Presse*, under the *nom de plume* of Vicomte Delaunay, 57 *Lettres parisiennes* on literature, art, and fashion. The only complete edition of these letters was brought out in 1858, with an introduction by Théophile Gautier. In 1839 she wrote a comedy, *L'École des journalistes*, but its representation was prohibited by the government. In 1843 her tragedy *Judith*, designed for Rachel, was performed at the Théâtre Français. Another tragedy, *Cléopâtre* (1847), and the comedy of *Lady Tartufe* (1853), were also written for that actress. Her comedies, *C'est la faute du mari, ou Les bons maris font les bonnes femmes* (1851), and *La joie fait peur* (1854), and her vaudeville *Le chapeau d'un horloger* (1854), were highly successful. Her last novels, *Marguerite, ou Deux amours*, and *Il ne faut pas jouer avec la douleur*, appeared in 1853, and a new edition of the former in 1858. An English translation of "The Cross of Berny," the joint production of Mme. de Girardin, Gautier, Sandeau, and Méry, was published in New York in 1873. A complete edition of her works has been published (6 vols. 8vo, Paris, 1860-'61). She was celebrated for beauty and wit.

GIRARDIN, Jean Pierre Louis, a French chemist, born in Paris, Nov. 16, 1803. He has popularized chemistry by teaching its application to art, industry, and agriculture, as professor at Rouen from 1838 to 1858, and since at Lille and Clermont. In 1835 he published *Leçons de chimie élémentaire* (2 vols.; 4th revised and illustrated ed., 1860-'62), which has been translated into Russian. His other writings include

manuals of pharmacy, botany, and chemistry, *Mélanges d'agriculture, d'économie rurale et publique, et de sciences physiques appliquées* (2 vols., 1852), and *Des fumiers et autres engrais animaux* (6th revised, enlarged, and illustrated ed., 1864).

GIRARDIN, Marc, or, as he signed himself, **Saint-Marc**, a French journalist, born in Paris in February, 1801, died there, April 11, 1873. After completing his classical studies at the college of Henry IV., in 1823 he competed for a professorship in the university, and won the title of *agrégé*, but, on account of his liberal opinions, was not appointed to a chair till 1827. In the latter year the French academy awarded a prize to his *Éloge de Bossuet*, and he became one of the political contributors to the *Journal des Débats*. His connection with this journal continued till 1859, when he joined the staff of the Orleanist *Journal de Paris*, and published *Souvenirs et réflexions politiques d'un journaliste*. In 1828 his *Tableau de la littérature française au 16^e siècle*, which confirmed his reputation as an elegant, witty, and forcible writer, was rewarded with another academical prize. In 1830 he travelled through northern Germany, and on his return was appointed to succeed M. Guizot as professor of history in the faculty of letters, and named master of requests to the council of state. In 1833 he visited southern Germany as far as Vienna; and in 1834 he published, under the title of *Notices*, the results of his two journeys beyond the Rhine. He was then appointed professor of French poetry at the Sorbonne, and elected to the chamber of deputies. His report on the organization of secondary instruction, presented in 1837, was highly valued. He entered at the same time the council of state and the council of public instruction; as a member of the latter board he greatly contributed to the extension and improvement of the system of historical teaching in the French colleges. In 1844 he was elected to the French academy. In 1848 he was designated minister of public instruction, in the last cabinet attempted under the monarchy, and under the republic and the empire held his position at the council of public instruction and at the Sorbonne. In 1863 he resigned his professorship at the latter institution. He was a frequent contributor to the *Revue des Deux Mondes*, and in 1869 he succeeded Sainte-Beuve as conductor of the *Journal des Savants*. In February, 1871, he was returned to the national assembly for the department of Haute-Vienne. Among his principal works are: *Cours de littérature dramatique, ou de l'usage des passions dans le drame*, an improved reproduction of his lectures; *Essais de littérature et de morale*; and *Souvenirs et voyages*, comprising the notices upon Germany before mentioned.

GIRARDON, François, a French sculptor, born in Troyes, March 16, 1628, died in 1715. He was furnished by Chancellor Seguier with the means of studying his art in Paris and Italy.

He was patronized by Colbert, and received orders from the king for groups and statues in several of the royal palaces and gardens. In 1690 he was appointed general inspector of sculpture, to succeed Lebrun. Some of his most celebrated works were destroyed during the revolution. The most important of those that remain are Richelieu's mausoleum in the chapel at the Sorbonne, and his groups of the "Bath of Apollo" and the "Rape of Proserpine" in the Versailles garden.

GIRAUD, Charles Joseph Barthélemy, a French jurist, born at Pernes, Vaucluse, Feb. 20, 1802. He studied at Aix, where he became professor of administrative science and president of the academy. In 1842 he became inspector general of the law schools in Paris and member of the French academy, and subsequently of the board of education; and he was vice rector of the academy of Paris till 1848. He was twice minister of public instruction in 1851 and member of the consultative council, from which he retired in August, 1852, in consequence of the confiscation of the property of the Orleans family. He has since filled the chair of Roman law in the faculty of Paris, and succeeded Laferrière in 1861 as inspector general of the judiciary. His principal works are: *Histoire du droit français au moyen âge* (2 vols., Paris, 1846); *Le traité d'Utrecht* (1847; translated into German and Spanish); *Les tables de Salpensa et de Malaga*, relating to the bronze tables found in the latter locality (2d ed., revised and enlarged, 1856); and *Études nouvelles sur Grégoire VII. et son temps*, in the *Revue des Deux Mondes* of March 15, 1873, *et seq.*

GIRGENTI. I. A province of Sicily, on the S. W. coast; area, 1,491 sq. m.; pop. in 1872, 289,018. Its surface is mountainous, with numerous valleys, which are exuberantly fertile, and yield corn, wine, and oil in great abundance. There is good pasturage, and the cheese made here is excellent. The chief natural productions are gypsum, bitumen, naphtha, salt, and especially sulphur. II. A city (anc. *Agri-gentum*), capital of the province, 8 m. off the coast, and 58 m. S. E. of Palermo; pop. about 18,000. It is situated on the Girgenti river, formed here by the junction of the Drago (anc. *Hypæas*) and San Biagio (anc. *Acrugas*), and on Mount Camicus, over 1,000 ft. high, which was the acropolis of ancient Agrigentum. It has four walls and gates, is called *magnifica* on account of its picturesque situation, and contains a fine English garden. But, excepting one long street, there are only steep and dirty lanes; yet the houses, wretched as they are, have fine balconies, and the inhabitants, including many beggars (though fewer than formerly), are dressed in a blue velvetene costume, and the women wear black shawls over their heads. The cathedral is an incongruous specimen of architecture, owing to various changes since its foundation in the 13th century. It contains many chapels, monuments, works of art,

relics, an ancient sarcophagus with sculptures supposed to represent the story of Phædra and Hippolytus, and a celebrated *porta vocis*, from whence a conversation, though carried on in the lowest voice, may be overheard at a distance of about 800 feet. There are many other churches, and formerly, when the population included a large number of priests, there were many convents and nunneries. The college of Girgenti is among the most important in Sicily, and the Lucchesiana library contains about 100,000 volumes. The palazzo Buonadonna is the principal of the palaces, and the most remarkable classical vestige is the temple of Zeus Polieus, now the church of Santa Maria de' Greci. Subterranean chambers filled with stalactites are supposed to have been quarries whence the stone was supplied for the buildings of the ancient city. There are immense granaries hewn in the rock near the port, which is protected by a mole, built of fragments from the temple of Zeus Olympius. Sulphur is the principal article of trade, and the other chief exports are grain and olive oil. While the *piccina* or water reservoir was one of the most remarkable public works of the ancient city (see AGRIGENTUM), Girgenti suffers from the utter want of a supply of water. The excavations of the ancient sepulchres have discovered painted vases more varied and larger than any others found in Sicily, and almost equalling those of Apulia and Campania. The spring or fountain near the city, to which Pliny refers as yielding petroleum or mineral oil, still exists; and the mud volcano described by Solinus, and to which the Saracens gave its present name of Maccalubba, continues to be one of the many curious sights in the vicinity of Girgenti.

GIRODET-TRIOSON, Anne Louis (GIRODET DE COUSSY), a French painter, born in Montargis in 1767, died in Paris, Dec. 9, 1824. He was a pupil of David, and obtained the great prize, which enabled him to go to Rome in 1789. During a residence of five years in Italy he sent to Paris the "Sleeping Endymion" and "Hippocrates declining the Gifts of Artaxerxes." On his return to Paris in 1795, he painted portraits of Chateaubriand and Hortense, and several large pictures, as "Danaë," "The Seasons" for the king of Spain, "Fingal, Ossian, and their Descendants welcoming to their Aërial Palace the Manes of French Heroes," and in 1806 his most esteemed work, "A Scene of the Deluge," which created a great popular sensation and bore away the prize from David's "Sabines." In 1808 he completed his "Funeral of Atala," in 1810 his "Revolt at Cairo," and in 1819 his "Pygmalion and Galatea." His literary remains were published in 1829, in 2 vols.

GIRONDE, a S. W. department of France, formerly a part of the province of Guienne, bordering on the bay of Biscay and the departments of Charente-Inférieure, Dordogne, Lot-et-Garonne, and Landes; area, 3,759 sq. m.; pop. in 1872, 705,149. The surface is almost

entirely level, the W. portion being a vast sandy, arid flat, collectively called the Landes. The chief rivers are the Garonne and Dordogne, which unite to form the Gironde, the Isle, Dronne, Dropt, and Leyre. The climate is temperate, and, except in the Landes, generally healthy. The principal productions are wheat, rye, millet, maize, hemp, fruits, wine, cork, charcoal, turpentine, pitch, and timber. Wine is the staple product, 55,000,000 gallons being made annually. The most renowned Bordeaux wines are produced in the Gironde. Building stone, salt, and chalk are the principal mineral products. The manufactures include calicoes, muslin, earthenware, paper, leather, glass, tobacco, brandy, beer, vinegar, salt, chemicals, and cordage. Ship building is extensively carried on in Bordeaux. Railways connect Bordeaux with Paris, Bayonne, &c. The department is divided into the arrondissements of Bordeaux, Blaye, Lesparre, Libourne, Bazas, and La Réole. Capital, Bordeaux.

GIRONDISTS (Fr. *Girondins*), a French political party, which played a conspicuous part in the legislative assembly and the convention. They derived their name from the deputies of the department of Gironde, whom they acknowledged as their leaders. Vergniaud, Gensonné, Guadet, Brissot (from whom they were sometimes styled Brissotins), Condorcet, Ducos, Boyer-Fonfrède, Louvet, Pétion, Valazé, Buzot, Barbaroux, Isnard, Lanjuinais, Carra, and Rabaut Saint-Étienne were the most prominent of their members. They enthusiastically promoted the proclamation of the republic (September, 1792), but strongly opposed the ultra-revolutionary party, called the Montagnards; and although eloquence, talent, and virtue were mostly on their side, they succumbed to the violent assaults of their opponents after having been driven by the current to vote in part and reluctantly for the death of Louis XVI. The Montagnards charged them with plotting against the unity of the republic and aiming at a federal organization of the country. After a most stormy debate on May 31, 1793, 22 of them were arrested on June 2, incarcerated at the Conciergerie, and on Oct. 31 executed. Mme. Roland, their inspirer, and her husband followed them soon after (November), the former dying by the guillotine, the latter by his own hand. The other Girondist leaders escaped from Paris, and, after vainly attempting to revolutionize several departments, were almost all either taken prisoners and beheaded, or committed suicide.—See Lamartine, *Histoire des Girondins* (8 vols., Paris, 1847).

GISLASON, Conrad, an Icelandic philologist and lexicographer, born July 8, 1808. He is the son of a popular poet, and studied at the university of Copenhagen, where he became professor of the Norse languages. Besides numerous editions of old Icelandic writings and commentaries on early Scandinavian poetry and philology, he has published a critical manual of the rudiments of the ancient Icelandic

according to the earliest records (1846); a Danish-Icelandic dictionary, the first ever published (1851); and an unfinished work on early Norse inflections (1858).

GISORS, a town of Normandy, France, in the department of Eure, in a fertile plain on the banks of the Epte, 33 m. E. S. E. of Rouen; pop. in 1866, 3,753. It is surrounded by gardens and beautiful promenades formed upon the remains of its ancient ramparts. Its castle, most of which is still standing, was very strong, and one of the chief fortresses of Normandy. It was built about the 11th century, but the donjon, an enclosed octagonal structure crowning a high artificial mound, was constructed in the 12th century by Henry II. of England. Under one of the towers is a dungeon, the walls of which are covered with carvings executed with a nail by some unknown prisoner. The parish church is filled with grotesque sculptures. The choir is said to have been built by Blanche of Castile.

GITSCHIN, a town of Bohemia, on the Cydlina, 50 m. N. E. of Prague; pop. in 1869, 6,570. It is walled, and has three gates and four suburbs. The parish church is built after the model of that of Santiago de Compostela in Spain. The former Jesuit college is used as barracks. It was a collection of wretched hovels before Wallenstein made it the capital of the duchy of Friedland in 1627, and the seat of a magnificent palace in 1630. The storming of Gitschin by the Prussians, June 29, 1866, ended the campaign in the territory of the Iser; and the overwhelming defeat of the Austrians here paved the way for the junction of the first and second Prussian armies and for the victory of Sadowa (July 3).

GIULIO ROMANO, an Italian painter and architect, whose family name was Pippi, born in Rome in 1492, died in Mantua in 1546. He was the most distinguished pupil of Raphael, whom he assisted in many of his paintings, and who made him his chief heir and appointed him to complete his unfinished works. After the death of his master, Leo X. and Clement VII. employed him, together with Gian Penni, to finish the history of Constantine in the Vatican; and he executed several works for the public edifices at Rome, was also employed there as architect, and painted his celebrated picture of the "Stoning of St. Stephen" for the church of San Stefano at Genoa. He was afterward invited to Mantua, and engaged both as architect and painter on the palazzo del Tè. The "Defeat of the Titans," in one of the halls of the palace, is one of the best examples of his style. He worked with his pupils on many other edifices at Mantua, and just before his death was appointed to succeed Sansovino as architect of St. Peter's.

GIURGEVO, a town and river port of Roumania, in Wallachia, on the left bank of the Danube, opposite Rustchuk, and 34 m. S. by W. of Bucharest; pop. about 15,000. Its citadel, the only one of its fortifications remain-

ing, stands on an island in the Danube called Slobodze, and is connected with the town by a bridge. Next to Braila it is the most important port on the Wallachian bank of the Danube, and carries on a considerable trade with Germany and Hungary. Giurgevo has figured in almost all the Turkish wars on the lower Danube, from the 15th century down to the war of 1853.

GIUDICI, Paolo Emiliani, an Italian author, born at Mussomeli, Sicily, June 13, 1812. He removed to Florence in 1840, and in 1844 published *Storia della letteratura italiana* (2 vols., 2d ed., 1853). He was professor at the university of Pisa from 1849 to 1852, and of æsthetics at the royal academy of fine arts in Florence from 1859 to 1862, of which he became secretary. In 1867 he was returned to the Italian parliament as a deputy for Sicily. His *Storia dei comuni* (3 vols., 1853-'4), a remarkable work, with new documentary evidence relating to the Italian communes, was followed in 1856 by his translation into Italian of Macaulay's "History of England," and in 1860 by his *Storia del teatro italiano*; and he has long been engaged upon a history of the Florentine democracy.

GIUSTI, Giuseppe, an Italian poet, born at Monsummano, in Tuscany, in May, 1809, died in Florence, March 31, 1850. He graduated as an advocate at the university of Pisa, and entered the law office of the future minister of justice, Capoguardi. But on account of a delicate constitution and disappointment in love, he abandoned the practice of his profession. He was in full sympathy with Manzoni, D'Azzeglio, and other opponents of Austrian domination in Italy, and his poem *Il Dies Ira*, on the death of the emperor Francis I. in 1835, attracted considerable attention. As a champion of moderate liberalism he was twice elected in 1848 to the Tuscan chamber of deputies; but after spending the summer of 1849 at the springs of Viareggio, he ended his life in the Florentine palace of his devoted friend Capponi. Though published anonymously, his writings had acquired a wide popularity all over Italy, when the appearance of a spurious edition in 1845 impelled him to have one prepared in his own name. But the most authentic and complete edition was published after his death, under the title of *Versi editi ed inediti* (Florence, 1852).

GIUSTINIANI, Agostino Pantaleone, an Italian prelate and philologist, born in Genoa in 1470, died at sea in 1536. Educated by the Dominicans of Florence, he became a professed member of that order in 1488, studied oriental languages, taught in several colleges, and in 1513 published his *Precatio Pietatis Plena* (8vo, Venice), in Hebrew and Latin. About this time he was appointed against his will bishop of Nebbio in Corsica, was present in 1516 at the fifth Lateran council, and solicited in vain his removal from the episcopal office. He then withdrew to the retirement offered him by the bishop of Ivrea, continuing his linguistic labors, and

went to Paris at the invitation of Francis I., who appointed him his chaplain, and under whose auspices he published shortly afterward his Hebrew-Latin edition of the book of Job. After filling for five years the chair of Hebrew in the university of Paris, he returned to Genoa, then torn by factions, was seriously wounded while trying to quell a riot, and thence proceeded to Nebbio, where he spent the remainder of his life in his episcopal duties. The principal work of Giustiniani is his *Psalterium Hebræum, Græcum, Arabicum, Chaldaicum, cum tribus Latinis Interpretationibus et Glossis* (fol., Genoa, 1516). In a note to one of the psalms is the first printed biographical sketch of Christopher Columbus. He also left in manuscript a polyglot New Testament.

GIVET, a town of France, in the department of Ardennes, on the Meuse, 22 m. N. by E. of Mézières, on the Belgian frontier; pop. in 1866, 5,801. It is a fortified place of considerable importance, its principal defence being the citadel of Charlemont on an adjacent height. The town consists of Le Grand Givet, or Givet-Notre-Dame, on the right bank, and Le Petit Givet, or Givet-St.-Hilaire, with the fortress Charlemont, on the left bank of the Meuse, which are connected by a bridge built by Napoleon I., and all of which are within the lines of fortification. Givet has manufactures of wire, pencils, and leather, for the last of which it is celebrated.

GIVORS, a town of France, in the department of Rhône, on the Gier and the Rhône, 13 m. S. of Lyons; pop. in 1866, 9,957. It has extensive glassworks and tanneries, brick yards, foundries, and silk factories. The place is important as a shipping point for coal. Near it the Givors-Gier canal, begun in 1765 and completed in 1781, joins the Rhône, which is thus connected with the Loire. In the vicinity are the ruins of the castle of St. Gerald and the convent of St. Ferréol.

GIZEH, *Ghizeh*, or *Jizeh*, a town of Egypt, capital of a province of the same name, on the W. bank of the Nile, 3 m. S. W. of Cairo. It was once a large city, but is now a petty village surrounded by heaps of ruins. The khedive has a palace there. About 5 m. from the village stand the three great pyramids called those of Cheops, Cephren, and Mycerinus. At Gizeh are ovens in which eggs have been hatched artificially ever since the days of the Pharaohs. (See PYRAMIDS.)

GIZZARD. See COMPARATIVE ANATOMY, vol. v., p. 181.

GLACIAL THEORY. See DILUVIUM, and GLACIER.

GLACIER (Fr. *glacier*, from *glace*, ice), a vast body of ice, filling some alpine valley, down which it slowly moves, the outlet of the snows which accumulate in the elevated portions of the mountain group. Glaciers may be found in all countries where extensive tracts lie above the snow line. In such localities the snows are ever accumulating, and the temperature

not rising sufficiently for any considerable proportion to be melted and flow down, they fill the spaces between the summits. By the pressure exerted by these vast collections the yielding material is forced through whatever opening is presented for its passage, and the great valleys leading to the base of the mountains are packed full of ice, which results from the snow being solidified by pressure, or by its own melting and freezing again. This, solid as it appears, is steadily though imperceptibly urged onward, conforming to all the irregularities of its channel, split sometimes by immovable ledges of rock, which stand like islands in its course, yet closing again below them with no trace of the fissure. These bodies of ice extend down the valleys till they reach a region where the temperature is sufficiently elevated to melt away the supplies as they arrive. Though these have gradually diminished toward the lower extremity of the glacier, so that this has flattened away somewhat like a wedge, and has also become narrower, the termination is frequently abrupt and even inaccessible. It presents an apparently stationary wall of ice, which, though seen to be constantly wasting, may yet by observations continued several days be found steadily advancing from the mountain. During the summer currents of water formed from superficial thaws flow over its surface, at least in the daytime, and fall in cascades into the numerous chasms, which extend across the glacier. They continue their course, hollowing out through the lower layers of the ice arched channels, which at the lower end appear like dark caverns extending far up into the icy mass. In high polar latitudes, where the line of perpetual snow comes down to the sea level, the phenomena of glaciers are displayed upon the grandest scale. Thus they were seen in lat. 79°-80° by Dr. Kane in 1855, spreading over the western coast of Greenland, and sloping so gently toward the water that the effect of an inclined plane was perceived only by looking far into the interior toward the east. In this long range the angle of the slope was from 7° to 15°. Yet the whole icy crust of this portion of the continent was always advancing and stretching itself out into the western bay, where masses of it were constantly detached and floated off as icebergs. From this glacier to the southern extremity of Greenland, more than 1,200 m., Dr. Kane imagined a deep unbroken sea of ice might extend along the central portions nearly the whole length of the continent.—The study of the geology of California had enabled Prof. Whitney to point out the traces of immense glaciers which at a time geologically recent had existed in the mountains of the Sierra Nevada. The alteration of the climate and the diminution of the rainfall consequent upon comparatively recent geological changes, have however caused the disappearance of the greater part of these, and it was not till 1870 that Mr. Clarence King discovered actual glaciers on

the N. side of the extinct volcano of Mt. Shasta in northern California. From the summit, 14,440 ft. above the sea, according to him, we look down on three considerable glaciers. One of these has a breadth of three or four miles, and sends branches four or five miles down the cañons. Its thickness is estimated in places to be 1,800 ft. or more, and its surface presents great crevasses, some of them 2,000 ft. long, and 30 or 40 ft. wide. Mr. S. F. Emmons has also found glaciers on Mt. Rainier or Tachoma in Washington territory, and Mr. Arnold Hague on Mt. Hood in Oregon; while more recently Mr. John Muir has succeeded in finding small glaciers much further southward in the sierras near the Yosemite valley on Mts. Lyell, McClure, and Hoffmann. They have the structure and movement of true glaciers, but the largest is not more than a mile in length, and they vary in breadth from half a mile to a few feet.—The phenomenon of glaciers reaching the sea and becoming icebergs was noticed by Darwin in the gulf of Penas, Patagonia. In northern Europe, it has been observed in Norway, in lat. 67° N., and in America on the W. coast of Greenland. Upon the Himalaya mountains the glaciers appear from the accounts of modern travellers to be exhibited in masses of stupendous height, as well as of vast extent. In the "Himalayan Journals" of Dr. Joseph Hooker, those of the eastern portion of the range, in the territories of Sikkim and Nepaul, are described in detail, and mention is made of one which presents a vertical height of 14,000 ft., the source of which is the great Kinchinjunga, whose summit reaches the elevation of 28,000 ft. above the sea. Other gigantic glaciers in the central Himalaya are described by Dr. Thomas Thomson ("Western Himalaya and Tibet"), and by Col. Madden and Capt. Richard Strachey, in the "Asiatic Researches," vol. xiv. Iceland, Spitzbergen, the Caucasus, and the Altai have their glaciers, which have been described by travellers; but no regions have afforded such convenient opportunities for studying them in detail as the Alps of Switzerland, Savoy, Piedmont, and Tyrol. Here, in the heart of Europe, they are found covering in detached portions an aggregate area computed at 1,484 sq. m. Between Mont Blanc and the borders of Tyrol 400 are reckoned, of which the greater number are between 10 and 20 m. long, and from 1 to 2½ m. broad. Their vertical thickness in many places is rated at 600 ft.; their range is from above the snow line, which is from 7,500 to 8,000 ft. above the sea, down to the level of 3,500 to 3,000 ft. Lateral ravines have their glaciers, which join as branches the ice currents of the great valleys. This interesting region was studied by De Saussure in the latter portion of the last century, and his views were published in his *Voyages dans les Alpes* (1796). Charpentier is distinguished among later explorers as the able advocate of the theory explaining the motion of the glaciers, afterward sustained by Agassiz in his

Études sur les glaciers (1840); and Prof. James D. Forbes of Edinburgh published in 1843 his "Travels in the Alps," &c., with observations on the phenomena of glaciers made in visits to them repeated in ten different summers, in which he crossed the principal chain 27 times by 28 different passes. Many other distinguished naturalists have aided not only to develop the true nature of glaciers, but to apply their phenomena to the explanation of past changes upon the earth's surface.—Spread over the broad valleys, glaciers appear immovable. The snow disappears from their face in summer, and thousands of streams are then produced, which waste their material; but with the return of winter the covering of snow is renewed, and no change may be perceived in the great mass except such as can be referred to these superficial causes. But by comparative observations made at different times, it is perceived that the great mass itself moves. The constant renewal of the waste at the lower extremity, already referred to, is one evidence of this. Objects on the surface, too, are found to be continually moving down, even when their position on the ice itself is not changed. From the high precipices at the sides masses of rock and stone fall along the edges of the glacier, but it is obvious that they do not remain there in an immovable talus; for where one glacier opens into another the piles of stones next the fork do not terminate as they join at this point, but are continued in a long mound of the same varieties of stone far down the glacier; and as other branches come in, each adds its new mound, till sometimes as many as six parallel ridges are thus produced. These may come in contact below, and thus be reduced in number, and even be blended with the piles at the edges. In some form, however, the mounds continue to the foot of the glacier; and there ridges of boulder-shaped stones and gravel are seen, which lie in front of the glacier, and are sometimes repeated in nearly parallel lines like the little ridges of sand and drift material along a sea beach, each one of which marks the limit of some previous high tide. So these great ridges of sand and stones, called *moraines* or borders, mark the limits reached by the foot of the glacier at former times; and as the tide marks are all removed when a high-course tide again sweeps far up the breach, so the ridges at certain periods are observed to move on before the advancing glacier, and mix together in a new and larger moraine at a greater distance from the mountains. It is in these periods that the habitable valleys of Switzerland are sometimes invaded by the terrible ice wall. Imperceptibly but irresistibly it is found advancing upon the farms and cottages. The warm summer weather is obviously hastening its dissolution, yet its dimensions do not sensibly diminish. The green forests slowly disappear before it; and the growing wheat almost feels its icy touch, before the soil is lifted by its ruthless ploughshare. When, after such an

advance, the glacier recedes to its former bounds, the surface it covered is found to be changed into a dismal waste of loose stones.—The gathering and distribution of these materials by action of glaciers have been subjects of special interest, from the resemblance in most of the phenomena exhibited to those connected with the distribution of the geological formation known as the drift. The loose rocks are worn into the rounded forms of boulders, and are similarly striated and grooved upon their surface, and sometimes polished. The rocks upon and against which the glaciers have pressed are found, wherever exposed to view, to be ground smooth and deeply marked with lines corresponding in direction with the course of the glacier at the spot. It is upon these resemblances, and others connected with minor details of the two classes of phenomena, that the glacial theory of Venetz and Charpentier, so fully elaborated by Agassiz, is based, accounting for the distribution of geological formations like the drift. The transporting power of glaciers was recognized by Prof. Playfair of Edinburgh as far back as the year 1816, and the occurrence of the enormous boulders on the Jura was attributed by him to glaciers, whose track he supposed lay at one time across the valley of Switzerland and the lake of Geneva, which now separate the Jura from the opposite summits of Mont Blanc. It is on these summits, at the distance of from 70 to 80 m., that are found the ledges of granite and other rocks, which are recognized as identical with the great boulders scattered over the surface of the Jura limestone. (See *Dr. Luvium*.)—The quantity of stony material, and the enormous size of the masses of rock carried along by glaciers, are little appreciated, even by many who have seen the loads apparently resting quietly on their surface. Sometimes the ice is almost concealed by the accumulated piles of stone. These do not sink into the ice, except as they occasionally fall into the chasms, and even then they are sometimes brought again to the surface by the action of the forces which keep most of them there. As the rock protects the ice beneath it from the action of the sun, which has its melting effect around, the rock is thus gradually lifted upon a pedestal of ice, at the same time that the whole is slowly moving down to a lower level. When the pedestal at last gives way, the rock slips down and the process is repeated. When once in the ice, the superficial melting may bring it again to the surface. The size of the fragments is often immense. Prof. Forbes saw one in the valley which must have been brought down by the glacier, which was nearly 100 ft. long, and from 40 to 50 high; and at the foot of the glacier of Swartzburg in the valley of Saas was another estimated to contain 244,000 cubic feet, requiring an average diameter of nearly 62 ft.—The rate of progress of glaciers, dependent upon various conditions, is no more uniform than that of rivers. It can in no case

be correctly estimated except by observations extending over many years. On the glacier of Aar M. Hugli erected a hut in 1827 at the foot of a fixed and well known rock. In 1836 the hut was 2,200 ft. from the rock, and in 1840 this distance had doubled. In the first period its progress had been 250 ft. per annum, and in the second 550. Forbes in 1842 found the remains of a ladder, which, it is believed, was the one left by De Saussure in 1788 at a point 16,500 ft. further up the glacier; if so, its yearly progress had been 375 ft. This movement extends through valleys in which the surface of the glacier appears to lie almost on a dead level. It is made manifest day by day by a row of stakes set up in a straight line across the glacier, and ranging with fixed points on the land at the sides. These are after a time observed to stand upon a semicircular line, the stakes near the middle moving faster than those near the margin. The importance of correctly estimating the rate of movement at short intervals and in different parts of a glacier, in order to determine the nature of the motion, appears to have been first appreciated by Agassiz in 1841, and by Forbes, who was engaged about the same time in his explorations. Agassiz discovered that the central portion moved faster than the marginal, and he was the first to correct the erroneous views into which he had been led by others on this point, from the fact of the great cracks generally lying in curved lines with the convexity directed up the course of the glacier. (*Système glaciaire*, by Agassiz, Guyot, and Desor, p. 462.) The upward convexity of the fissures is accounted for by the fact that, if the central portion moves fastest, the lines of greatest tension are downward and toward the middle, and the ice gives way at right angles to these lines. Forbes, by careful instrumental observations in 1842, detected the rate of movement in periods of 24 hours, and was able even to notice that which took place in an hour and a half. He proved the faster rate of the central portions, and also that the portions of the glacier near the surface moved faster than those near the bottom. The motion he found was greatest on the slopes of greatest descent; in warm weather more rapid than in cold; yet always continuous, and not exhibited in the manner of jerks. Such facts are opposed to the theory of De Saussure, that the glaciers move by slipping along upon their bed, the motion being made more easy by the buoyant property of the water flowing beneath them, and the propelling force being that of gravitation. Moreover, the ice, without being broken up, was observed not to be interrupted in its movement by the contracted passages through which it was sometimes forced to pass, nor by solid hills of rock, which lay like islands in its path. The theory maintained by Charpentier, and supported by Agassiz in his *Études sur les glaciers*, was that the glacier slid upon its bed, not necessarily in large bodies pushed on by gravitation, but that different

portions were impelled by different degrees of force, arising from the expansion of the water congealing in all the fissures and capillary tubes of the ice into which it found its way. The facts developed by Forbes—that the motion was greatest in the warm summer weather, when the temperature did not descend below the freezing point, and that it did not cease when the ice was no longer liquefied in the cold of winter—demanded some new explanation. With the other phenomena they were regarded by him as sufficient to establish the fact that ice in large bodies is not a brittle solid, but that it possesses, particularly when saturated with water, so much plasticity, that with time it can yield to a stupendous and steadily exerted force, and move somewhat like a body of viscous pitch or lava, which, while it appears brittle when suddenly struck, can yet mould itself in the mass to the surface upon which it rests. By this theory, which was generally received even by those who first opposed it, all the difficulties attending the explanation of the movement disappear. It was confirmed by a simple experiment made by Mr. Christie, secretary to the royal society. He filled with water a 10-inch hollow shell of iron, the shell itself being besides $1\frac{1}{4}$ in. thick, and exposed this to severe cold. As the water expanded in freezing, a cylinder of ice was pushed up through the fuse hole, and it continued to increase in length as the water continued to freeze. As the outer portions of the water must have been first converted into ice, it is plain that it was this so-called solid material which was forced through the narrow aperture and made to assume the form of a cylinder of its diameter. But the peculiar nature of this quality of mobility belonging to ice has been more perfectly explained, together with some of the other phenomena of glaciers, by the researches of Tyndall and Huxley, an account of which is published in the "Philosophical Magazine," vol. xv. (4th series), 1858. The property of particles of ice when exposed to higher temperatures than the freezing point to adhere, and under pressure to unite in one mass, was observed by Faraday, and was afterward made the subject of various experiments by Tyndall and Huxley. They found that compact transparent ice might be crushed to fragments, and these be made by a hydraulic press to assume in a few seconds the shape of any mould, recovering in their new form perfect solidity and transparency. A straight bar of ice was bent into a semicircular form by using a succession of four moulds of gradually increasing curvature. As the prism conformed itself to these, cracks were produced, and crackling sounds were emitted, reminding one of those which are so often noticed among the phenomena of glaciers. By reference to this before unobserved property of ice the movement and unbroken continuity of glaciers and their branches are now explained.—The glaciers from their very source present a series of changes of

structure, which have been critically observed and traced, and in some instances illustrated and explained by experiments on a small scale with other materials. The snowy region known by the French term *névé* is formed of dry and granular snow, which extends for miles, sometimes broken by immense chasms, and at others presenting no irregularities of surface such as are common to the glacier below, no streams, crevices, moraines, or cones. The snow lies in strata, which reach to great depth, each representing the accumulation of a single year, the lowest the most dense and approaching the blue color of ice. These bodies move onward to form the glacier proper; and as they pass into this, their material assumes more and more the character of compact ice. But a remarkable and peculiar feature is the veined or laminated structure, real or only apparent, which it assumes. This is noticed in the walls of the fissures, and is also displayed upon the surface of the glacier itself, when this has been wasted by rain. Thin laminae of transparent blue ice alternate with others of white porous ice, and standing together in a vertical position the edges of the former project a little above those of the latter, which more readily melt, and thus a ribbed appearance is produced. The direction of the laminae is across the fissures, and as observed by Tyndall and Huxley these are produced at right angles to the direction of greatest tension. They find an analogy between the lamination of the ice and the slaty cleavage of the clays and slates, both which they refer to pressure causing the development of divisional planes in lines approximately at right angles to the direction of pressure. Hence the obliquity of the lamination to the sides of the glacier as the lines extend from the margin toward the middle and down its course; and the deviation directly across the glacier, or at right angles with this and parallel with its axis, as the form of its bed or other causes produce a pressure in the one case exerted longitudinally and in the other laterally with the line of the glacier. By submitting plastic materials, as wax, to pressure, and observing the laminated structure these assumed, these investigators were led to this explanation of the phenomenon as developed in glacier ice; but others, as Prof. Forbes, describe the white ice as produced merely by lines of cavities or of air bubbles in the blue ice itself, the result, according to the observation of Prof. James Thomson, of partial liquefaction induced by pressure; and Prof. William Thomson attempts to prove "that the first effect of pressure not equal in all directions on a mass of snow ought to be, according to the theory, to convert it into a stratified mass of layers of alternately clear and vesicular ice, perpendicular to the direction of maximum pressure." But the complete explanation of this structure will require experimental researches upon ice which have not yet been made.—Another in-

teresting feature in the appearance of glaciers, to which attention was first directed by Forbes, is the distribution of what he called the dirt bands, discolored streaks seen upon the surface, which he supposed were connected with the veined structure, appearing where this is more energetically developed than elsewhere, and caused by the collection of sand and dirt in the decomposed portions of the softer laminae. These are arranged in curves, the convexity of which is turned down the glacier, and are frequently so obscure that they are distinguished only by looking down upon them from some elevation. Tyndall and Huxley describe them as spread out upon the smooth ice below ice cascades, and caused a similar symmetrical arrangement of dark-colored sand distributed upon the surface of a current of fine mud, which they made to flow from a reservoir down an inclined trough, through a narrow channel, which spread out below over a widened area.—Various other phenomena connected with the structure and motion of glaciers are discussed in the treatises on this subject already referred to. Besides the works mentioned, see "Norway and its Glaciers" (1858), and "On the Theory of Glaciers" (1859), by James D. Forbes; *Die Gletscher der Jetztzeit*, by A. Mousson (1854); *Neue Untersuchungen über die physikalische Geographie und die Geologie der Alpen*, by the brothers Schlagintweit (1854); "The Glaciers of the Alps," by John Tyndall (1860); "The Old Glaciers of North Wales and Switzerland," by A. C. Ramsay (1860); and "The Land of Desolation," by Dr. Isaac I. Hayes (1871).

GLADBACH, the name of two towns of Prussia, in the province of the Rhine. **I. Mönchen-Gladbach**, in the district and 16 m. W. by S. of the city of Düsseldorf; pop. in 1871, 26,326 (against 4,090 in 1852). It is one of the chief seats of the industry of Rhenish Prussia, having numerous manufactories of cotton, linen, and silk goods, tobacco, machines, and wire, and a number of bleaching grounds. Formerly there was here a celebrated Benedictine abbey, which was founded in 972 by Archbishop Gero of Cologne. **II. Bergisch-Gladbach**, in the district and 8 m. N. E. of the city of Cologne; pop. in 1871, 6,195. It contains manufactories of paper and percussion caps. In its vicinity is the village of Bensberg, with a castle built in 1710, and now converted by the Prussian government into a military academy.

GLADIATORS (Lat. *gladius*, a sword), in Roman antiquity, men who fought with each other or with wild animals at the public games, for the entertainment of spectators. They were originally captives, slaves, or condemned criminals; but under the republic free-born citizens, and under the empire knights, senators, and even women, fought in the arena. Those who were malefactors were divided into two classes: those condemned *ad gladium*, to be killed within a year, and *ad ludum*, who were discharged if they survived three

years. Professional gladiators were trained in schools at Rome, Capua, and Ravenna, by overseers (*lanista*), who either purchased and maintained them to let them out for public exhibitions, or only trained them for their owners. Clodius and Milo employed gladiators as a political force in their struggle; Cæsar had 5,000 of them at Capua, who were not overlooked by Pompey. They were taught the postures to be assumed in falling and in dying, and such food was chosen as would thicken their blood in order to give the spectators a more leisurely view of their death. The public combat between gladiators began with weapons of wood, which were soon exchanged for deadly arms. Usually they were matched by pairs. According to their arms or modes of fighting, gladiators were divided into numerous classes. The *andabata* fought blindfolded, the *caterarii* in troops, the *essedarii* in chariots, the *equites* on horseback, the *hoplomachi* in full armor, the *laqueatores* with the lasso, the *mirmillones* with the weapons of the ancient Gauls, the *Samnites* with those of the people of Samnium, the *Thraeces* with a dagger and round buckler. The *retiarii* were lightly equipped, and fought by throwing a net lasso-fashion over the head of their antagonist, and then despatching him with a three-pointed lance or trident. If a combatant was vanquished, but not killed, his fate depended on the people, who turned their thumbs down if they wished him to be spared. A man who had once been a gladiator was always regarded as disgraced, and, if a knight, could not resume his rank. Gladiatorial contests were first exhibited at Rome in 264 B. C., as an entertainment at funerals, and they continued till the reign of Honorius (A. D. 404), when Telemachus, a Christian monk, rushed between two contending gladiators at Rome, and by his self-sacrifice occasioned the decree for their abolition. The passion for them had risen to its height under the emperors. Titus ordained a combat of 100 days, and Trajan one of 123 days, in which 10,000 gladiators fought, and 11,000 fierce animals were killed. Rome was imperilled about 72 B. C. by a rebellion of gladiators. (See SPARTACUS.)

GLADIOLUS (Lat. *gladius*, a sword), a genus of ornamental plants of the *iridaceæ* or iris family. A flattened solid bulb or corm sends up a stem bearing several long, sword-shaped, strongly nerved leaves, and terminating in a spike of large and usually showy flowers, which are somewhat irregular from the difference in the size of the petals, and more or less two-lipped. Sword lily and corn flag are names sometimes applied to these plants, but they are generally called by their botanical name *gladiolus*. There are both hardy and tender species. The hardy ones are planted in autumn at the same time with hyacinths, tulips, &c.; the principal ones cultivated are *G. communis*, from Europe, which has been longer in the gardens than any other, and bears a few rose-colored, sometimes white flowers, and *G. Byzantinus*,

from the Levant, which has larger and more showy purple flowers. Among the tender species which are grown in pots in winter, or planted in the open ground in spring, are *G. cardinalis*, *G. blandus*, and *G. peltatus*, from the Cape of Good Hope. The most popular and brilliant of these plants are hybrids from these and probably others; they originated in the garden of the duke of Artemberg, a noted amateur of Ghent; and as their characters are permanent and they are fertile among themselves, these hybrids have received the garden name of *gladiolus Gandavensis*. In size, beauty of form, and variety of coloring of the flower, these hybrids far excel any of the species, and they are constantly improving in these respects; new seedlings of merit are each year raised both in Europe and America, and the catalogues now offer named varieties in hundreds. The colors range from pure white through rose to crimson, scarlet, and violet;

Common Gladiolus.

some have yellow as the predominating color, and there are various intermediate shades of salmon, chamois, and others; besides self-colored flowers, there are those variously striped, stained, and shaded in the most brilliant and pleasing combinations. The cultivation is very easy, as they will grow in any light, rich garden soil; the bulbs are planted in spring, and, if a succession of flowers is desired, at intervals from March until May; they are set 2 or 3 in. deep, and 10 to 12 in. apart each way, and need no other care than to be kept clear of weeds, and to have such stalks as need it tied to sticks. A very effective plan is to plant the bulbs where the flowers will be seen against a background of evergreens; they may also be introduced among rhododendrons, azaleas, and other spring-flowering shrubs. In autumn when the stalks are dead the bulbs are taken up, labelled, wrapped in papers, and kept in a dry place, where they will not freeze, until spring.

The number of bulbs annually produced varies from one to several, according to the variety. At the base of the bulbs there will usually be found numerous bulblets, the size of a pea or smaller; planted the next spring, these make flowering bulbs in two years. New varieties are obtained from the seed; these produce flowers the third or fourth year after sowing.

GLADSTONE, WILLIAM EWART, a British statesman, born in Liverpool, Dec. 29, 1809. He is the fourth son of Sir John Gladstone, a wealthy merchant, who relinquished a small business in Glasgow about 1785, and removed to Liverpool, where he acquired a large fortune in the West India trade, and was created a baronet in 1846. The son was sent to Eton, and while there gave full promise of the special brilliancy which marked his course at Oxford, where he graduated at Christchurch in 1831, as double first class, the highest honor, and one rarely attained, and became a fellow of All Souls'. After travelling for a short period, he entered parliament in December, 1832, as member for Newark, a nomination borough belonging to the duke of Newcastle, which he continued to represent till 1846. In December, 1834, he was appointed by Sir Robert Peel a junior lord of the treasury, and in 1835 under secretary for colonial affairs, which office he filled for only two months, when the ministry was overthrown. He continued a useful and active as well as brilliant member of the opposition party led by Sir Robert Peel until that statesman's return to power in 1841, when he was sworn a member of the privy council and appointed vice president of the board of trade and master of the mint. In this position he explained and defended in parliament the commercial policy of the government, and the revision of the British tariff in 1842 was almost entirely his work. He was a constant contributor to the "Quarterly Review," chiefly on literary and ecclesiastical subjects. He also published in 1838 a work on church and state, in which he maintained extreme high-church views, and which was severely criticised by Macaulay in the "Edinburgh Review." In May, 1843, he succeeded Lord Ripon as president of the board of trade, but in February, 1845, he resigned his offices on the introduction of the measure for the increase of the Maynooth grant, which was directly opposed in principle to the opinions he had expressed in his work on church and state. In November, 1845, Sir Robert Peel resigned, but, on the failure of Lord John Russell to form a government, he was recalled and reconstructed his cabinet, Mr. Gladstone becoming secretary for the colonies. In the free-trade measure announced by Sir Robert Peel in January, 1846, Mr. Gladstone fully concurred; but being unwilling to remain under obligations to the duke of Newcastle, he resigned his seat for Newark, and was out of parliament during the debates on this measure. At the general election of 1847 he was chosen to represent the university

of Oxford, and one of his first speeches in parliament was in favor of the bill for the removal of the disabilities of the Jews, which he had opposed in 1841. His speech against the foreign policy of Lord Palmerston in the Don Pacifico debates was generally regarded as one of the most admirable pieces of English eloquence of recent times. In the ministerial crisis of 1852 he was invited by Lord Derby to enter his cabinet, but declined, and on the overthrow of that minister in December of the same year accepted the office of chancellor of the exchequer under the earl of Aberdeen. While holding this office he introduced in 1853 his celebrated budget in a remarkable series of addresses which were pronounced by Lord John Russell "to contain the ablest expositions of the true principles of finance ever delivered by an English statesman." On the resignation of Lord Aberdeen in February, 1855, and the elevation of Lord Palmerston to the premiership, Mr. Gladstone retained his office of chancellor of the exchequer; but he soon resigned, together with the other Peelites members of the government, in consequence of Lord Palmerston's refusing to oppose a motion of inquiry into the conduct of the Crimean war, which was considered indirectly to convey a censure on the duke of Newcastle and Mr. Sidney Herbert. On the overthrow of Lord Palmerston's government and the second accession of Lord Derby to power in 1858, Mr. Gladstone again declined the pressing overtures of that nobleman, but in November accepted an appointment as lord high commissioner extraordinary to the Ionian islands. In 1859, on Lord Palmerston's return to office, Mr. Gladstone again became chancellor of the exchequer. He was chiefly instrumental in procuring the repeal of the duty on paper, and the ratification of the commercial treaty between England and France, negotiated by Mr. Cobden and M. Chevalier. From this time Mr. Gladstone has been classed as an advanced liberal. He also during the few succeeding years exhibited a theoretical knowledge and a practical skill in the management of the national finances that excited the admiration of all Europe. At the general election of 1865 he was rejected by the university of Oxford, but was returned for South Lancashire. After the death of Lord Palmerston in the same year, Mr. Gladstone became the leader of the house of commons. He procured the adoption of the measures recommended by the ministry for the suppression of the Fenian disturbances in Ireland, but a reform bill introduced by him on behalf of the ministry was defeated, and he and his colleagues resigned, and were succeeded by one formed by Lord Derby and Mr. Disraeli, July 6, 1866. In the early part of the session of 1868 Mr. Gladstone introduced a series of resolutions in favor of the disestablishment and disendowment of the Irish church. Soon after a bill for effecting this object was passed by the commons, but rejected by the peers. In the general election

of that year Mr. Gladstone was defeated as a candidate for Southwest Lancashire after an exciting contest, but was returned by a large majority by the borough of Greenwich. Mr. Disraeli's ministry resigned in December, and Mr. Gladstone succeeded him as premier. The Irish church bill was passed at the session of 1869, the Irish land act in 1870, and the purchase of commissions in the army was abolished in 1871 by the exercise of the royal prerogative. He also procured the abolition of confiscation in English penal law. During the war between France and Germany the English government, under the lead of Mr. Gladstone, maintained a complete neutrality, and in order to avoid all complications with the great powers of the continent reluctantly consented to the abrogation of those provisions of the treaty of 1856 with Russia which established the neutrality of the Black sea. Under his administration the treaty of Washington, by which the matters in dispute between the United States and Great Britain were settled, was negotiated and carried into effect. At the session of 1873 Mr. Gladstone introduced an elaborate bill for the reform of university education in Ireland, the main object of which was the establishment of a system which should be acceptable to both Protestants and Catholics. The discussion in the house of commons made it clear that the bill satisfied neither, and it was defeated. Mr. Gladstone and his colleagues immediately resigned. The queen called upon Mr. Disraeli to form a new ministry, but after some days he announced to the house that he was unable, and if not unable unwilling, to do so, and declared that he did not regard the defeat of the university bill as exhibiting such a want of confidence in the general conduct of the government as required the resignation of the ministry. Mr. Gladstone and his colleagues accordingly returned to their posts; but repeated defeats of the ministry followed, and on Jan. 24, 1874, Gladstone unexpectedly issued an address announcing the dissolution of parliament, assigning as a reason for the step that the government felt its power was ebbing. He promised a diminution of local taxation and the abolition of the income tax. The succeeding elections for a new parliament resulted in the return of 351 conservatives and 302 liberals, a conservative majority of 49, against a liberal majority of 112 in that of 1868. Mr. Gladstone himself was returned from Greenwich by a vote of 5,968, against 6,386 in 1868. On Feb. 17 he resigned, and on the following day Mr. Disraeli accepted the premiership.—Mr. Gladstone's published works are: "The State in its Relations with the Church" (2 vols., 1838); "Church Principles Considered" (1840); "Studies on Homer and the Homeric Age" (3 vols., Oxford, 1858); "Essays on *Ecce Homo*," and a pamphlet on the Irish church question, entitled "A Chapter of Autobiography" (1868); and "Juventus Mundi: the Gods and Men of the Heroic Age" (1869). He has

supervised a translation of Farini's *Stato Romano* (4 vols., London, 1859). In 1851 he published a "Letter to Lord Aberdeen" on the cruelties inflicted on the political prisoners confined in the dungeons of Naples, which produced a universal and very deep impression. His statue, by Adams Acton, was unveiled in Liverpool on Sept. 11, 1870.

GLADWIN, an E. county of Michigan, intersected by Titibiwassee river; area, 570 sq. m.; returned without population in 1870. Its surface is uneven, and its soil consists of a sandy loam.

GLAGOLITIC, one of the two ancient Slovenic, or less correctly Slavonic, forms of writing. The name is derived from the fourth letter, *glagol*, equivalent to our hard *g*; it is also known as the Bukvitza, from *bukva*, letter, or from the names of the second and third letters, *buk* and *vide*, or *b* and *v*. Its formation is attributed by some to St. Jerome, and by others to Methodius, the apostle of Pannonia and Great Moravia (about 860). The shape of the 32 letters (of which 27 are also numeral signs) is very grotesque and protean, little resembling the Greek. The Glagolitza was used in Illyria, Dalmatia, and Bulgaria. The other form of Slovenic writing is the Kyrilitza, contrived by Cyril, the reputed brother of Methodius, many letters of which are like the Coptic, because they imitate the Greek forms. This consisted originally of 40 letters, and is still in use among the eastern Slavs and the Romanians. The Russian *azbuka* or *bukvar* (alphabet) is a slight modification of the latter. These systems have been much extolled by some authors; but, though representing all sounds of the languages, they are imperfect, inasmuch as they contain single signs for complex sounds, such as *tz*, *tch*, *shch*, *ya*, *yu*, *yu*. The nations that employ these graphic systems belong mostly to the Greek church; while the Catholic Slavs (Poles, Bohemians, Slovaks, Lusatians, &c.) make use of the Latin or the so-called German letters, with some modifications. The most remarkable works in Glagolitic writing are: *Glagolita Closianus*, by Count Paris Oloz of Trent in the 11th century, edited by Kopitar (Vienna, 1836); *Codex Aesemanius*, containing *Lectiones Evangelicas*, *Bibliotheca Vaticana*, in A. Mai's *Scriptorum Veterum Nova Collectio*; and *Codex continens Psalmos, cum Expositione Sancti Athanasii*, &c., at Bologna. All these are in the Bulgarian idiom; *Breviarium* (edited by Brozich, Venice, 1561) is in Servian.

GLAIRE, Jean Baptiste, a French theologian and orientalist, born in Bordeaux, April 1, 1798. He completed his theological studies at St. Sulpice seminary, Paris, and afterward studied the oriental languages. Taking holy orders in 1822, he taught Hebrew in his seminary, and in 1825 he succeeded Chaunac de Lanza as professor of Hebrew at the Sorbonne. In 1841 he was made dean of the faculty of theology, and in 1843 was transferred to the chair of exegesis. In 1840 he

became a canon of the metropolitan chapter of Paris, and in 1851 vicar general of Bordeaux. His most important works are: *Lexicon Manuale Hebraicum et Chaldaicum* (1830; new ed., considerably enlarged and improved, 1843); *Principes de grammaire hébraïque et chaldaïque* (1832; new eds., 1836 and 1843, with a *Chrestomathie chaldaïque et hébraïque*); *La sainte Bible en Latin et en Français*, with notes, explanations, &c. (8 vols. 4to, 1834); *Torath Mosché, Le Pentateuque*, with a French translation and notes, of which the first two parts only have been published, Genesis and Exodus (2 vols. 8vo, 1836-'7); *Introduction historique et critique aux livres de l'Ancien et du Nouveau Testament* (6 vols. 12mo, 1836), an abridgment of which appeared in 1846 (1 vol. 8vo.); *Manuel de l'hébraïsant*, containing a grammar, a chrestomathy or choice pieces, and a lexicon (1856); *Concordances arabes du Coran*; *Principes de grammaire arabe* (1857-'61); *La Bible selon la Vulgate*, translation and notes (1863); and *Dictionnaire universel des sciences ecclésiastiques* (2 vols., 1867).

GLAIS-BIZON, Alexandre, a French politician, born at Quintin, Côtes-du-Nord, March 9, 1800, died Nov. 7, 1877. He acquired prominence as an opposition member of the chamber under Louis Philippe. After the revolution of 1848 he was elected to the constituent assembly, but owing to his hostility to Louis Napoleon soon withdrew from political life. In 1863, however, he again became conspicuous as a representative by his incessant and eccentric interruption of the debates, and by almost invariably opposing the measures of the government. In the elections of 1869 he was defeated in his native department, but was returned in one of the metropolitan districts. On Sept. 4, 1870, he became a member of the government of national defence without portfolio, and subsequently represented it with Crémieux at Tours. The charges of embezzlement brought against him by the press he strenuously denied, declaring he had sacrificed his fortune in the public service. He was imprisoned by the commune in May. He wrote several plays, and in 1868 became director of a democratic weekly journal, *La Tribune française*.

GLAISHER, James, a British meteorologist, born about 1800. He early became conspicuous as an aeronaut, and subsequently as a meteorologist. In one of his balloon ascensions, Sept. 5, 1862, he reached the height of 37,000 ft. (See *AERONAUTICS*.) He was elected fellow of the royal society in 1849; succeeded in 1865 Admiral Fitzroy as president of the meteorological department of the board of trade; and was one of the founders of the meteorological society, and, excepting the period during which he was its president, acted as secretary till 1873, when he resigned. He has published "Travels in the Air" (London, 1870), a popular account of balloon voyages and adventures.

GLAIZE, Auguste Barthélemy and Pierre Paul Léon. See supplement.

GLAMORGANSHIRE, a S. county of Wales, bordering on Caermarthenshire, Brecknockshire, Monmouthshire, the Severn, and Bristol channel; area, 855 sq. m.; pop. in 1871, 896,010. The northern portion is mountainous, but the southern is level and fertile. The principal crops are wheat, barley, oats, beans, peas, vetches, and turnips. The horned cattle are of superior quality, and in the mountain districts great numbers of sheep and ponies are reared. Glamorganshire is famous for its coal and iron mines. In the neighborhood of Merthyr-Tydvil the iron works are on a gigantic scale; within a small circuit are more than 60 blast furnaces, some of which have 6,000 workmen. Vast quantities of coal and iron are annually exported from Cardiff. This county has also some woollen manufactories, and numerous canals and railways. The principal rivers are the Rhymney, the Taff, and the Tawe. The chief towns are Cardiff, the capital, Merthyr-Tydvil, Swansea, and Neath.

GLAND (Lat. *glans*, an acorn), in anatomy, the general name of a variety of organs whose functions are to elaborate the various products of secretion from the blood, to perform certain offices connected with absorption and assimilation, and to assist in preparing and maintaining the circulating fluid in a normal condition. Of the first class of glands the liver and the salivary glands are examples, of the second the mesenteric and lymphatic glands, and of the third the spleen. The true secreting glands are of various form, size, and structure, but are all constructed with special reference to the arrangement of the nucleated and epithelial cells and tubes or cavities which enter into their texture; their products are poured forth either on the outer surface of the body, or into some cavity or canal communicating externally, and the cells which effect the separation of their special secretions from the blood are generally in the relation of epithelium cells to the inversions of the skin or mucous membranes that form the greater part of their follicles or tubuli. These cells generally minister to the act of secretion by absorbing from the blood its watery and saline ingredients, which they afterward exhale in the requisite proportions, and by generating at the same time a peculiar ingredient by their own powers of assimilation; thus producing a secreted fluid different in composition from the blood from which it was derived. The great majority of glands provided with ducts may be divided into three groups, according to the modes in which the cell-containing tubes are arranged: 1, the simple tubular glands, like the follicles of the stomach and intestines, which seem to be mere depressions in the mucous membrane, or elongated vesicles lined with secreting cells; 2, the aggregated or conglomerate glands, in which a number of follicles are grouped into lobules, and these again into lobes joined by loose areolar tissue, like the salivary, mammary, pancreatic, pros-

tate, and lachrymal glands, and also the liver; 3, the convoluted tubular glands, as the perspiratory and sebaceous glands ending in dilatations, cul-de-sacs, or loops. In all a large extent of secreting surface is packed in a small compass; while one end of the gland and duct opens on a free surface, the



Ultimate Glandular Follicles.
a. Membrane of the follicle. b. Layer of epithelium lining the follicle, seen in profile. c. Surface of epithelium cells, lining the whole interior of the follicle.

opposite end is closed, and has no direct communication with blood vessels or other canals. The glandular organs have been divided into two classes, according as their product is excrementitious and to be cast off, or to be used

c.

Mucous Glandula, from the Cavity of the Mouth.
a. Investment of areolar tissue. b. Excretory duct. c, c. Secreting follicles. d. Branches of the excretory duct.

within the system; the former are called more properly excretory glands, and include the kidneys, and those which supply the cutaneous and pulmonary transpiration and the peculiar faecal matters of the lower part of the intestinal canal; the true secretory glands are the gastric, salivary, mammary, sebaceous, mucous, lachrymal, Brunner's, and the pancreas. The kidneys, liver, mammary glands (secreting respectively urine, bile, and milk), and the pancreas are described under their proper titles; the salivary and gastric glands are noticed under Digestion; the sebaceous, ceruminous, odoriferous, and sudoriparous glands (secreting the oily, waxy, odorous, and perspiratory matters of the surface), are treated in the article Skin; the follicles of Lieberkühn (in the small intestine), Brunner's glands in the duodenum, and the solitary glands most numerous in the

cæcal region, under **INTESTINE**; the lachrymal glands under **EYE**; and the so-called glands of Pacchioni and the pineal body or gland are alluded to in the article **BRAIN**. The air passages of the chest and head, the alimentary canal above the stomach, and the genito-urinary apparatus, are provided with solitary and aggregated glands and follicles for the secretion of their lubricating mucus; the tonsils are glandular masses principally, and there are numerous follicles in the posterior fauces, and in the neighborhood of the epiglottis and entrance to the larynx, whose diseased secretions and ulceration constitute the kind of *folliculitis* popularly called "clergyman's sore throat."—Another system is that of the vascular or ductless glands, which possess all the elements of glandular structure, except the efferent ducts; restoring therefore to the blood whatever they take from it, it is generally admitted that they perform some part in the process of sanguification, probably acting upon such nutrient materials as are taken up directly by the blood vessels without in the first instance passing through the absorbents. These glands are the spleen on the left side of the abdominal cavity; the thymus gland, a foetal organ in the anterior mediastinum; the thyroid body, on the anterior portion of the neck; and the supra-renal capsules, surmounting the kidneys; these will be described in their alphabetical order. They are composed of vesicles or sacculi, simple and closed, or branched, of a delicate membrane surrounded with a vascular plexus, and filled with an albuminous fluid containing fat granules and nucleated cells. The opinion that these glands serve for the higher organization of the blood materials is supported by the fact that they are especially large and active during foetal life and childhood, when the most abundant supply of nutrient fluids is necessary. They are not essential to life in the adult; the thymus entirely disappears, the thyroid may be completely disorganized, and the spleen be removed (as has been often done in animals), without fatal consequences; the supra-renal capsules seem to be connected with the production of pigment, and their morbid condition or atrophy is connected with the peculiar disease known as "bronzed skin."—The last group includes the absorbent glands, the patches of Peyer, the mesenteric, and the lymphatic glands. The lacteals and the fluid they convey have been described under **ABSORPTION** and **CHYLE**. Peyer's glands, most numerous toward the ileo-cæcal valve, are intimately connected with the lacteals; whether single or in clusters, they are always in that portion of the intestine which is opposite the mesentery; they are capsules, containing fatty and albuminous matters, with nuclear particles and cells, all apparently undergoing rapid changes; the exterior and interior of the capsules are freely supplied with blood. In the mesentery are the mesenteric glands, which bear the same relation to the lacteals as the absorbent glands to

the lymphatics; each gland is enclosed by a fibrous sheath, which forms by its partitions an internal supporting framework; the intervening alveoli are filled with a grayish pulp, as in Peyer's patches, penetrated by a fine capillary plexus, and in free communication with the afferent and efferent ducts between which they are situated; the number of corpuscles of the chyle is greatly increased by passing through these glands, which perform a most important part in the blood-making or assimilating process. No lacteal or lymphatic reaches the terminal thoracic duct without passing through one or more of these glands. In the lower vertebrata plexuses of lymphatics occupy the places of the glands of birds and mammals. Glands are situated all along the course of the lymphatic vessels, both superficial and deep-seated. Familiar examples are the glands in the groin, the seat of syphilitic and scrofulous abscesses, and often swollen from irritation of any portion of the lower extremity; the axillary glands in the armpit, often requiring surgical interference for enlargements and abscesses; and the glands on the sides of the neck, frequently the seat of scrofulous suppuration.

GLANDERS, a malignant disease of the horse and other equine species, of a highly contagious character, and which may be communicated to man, but not, it is said, to other animals. It occurs in two forms, depending on the parts affected. When in the lymphatic system it is called farcy; when in the nasal cavities, glanders. The pus of one will produce the other, and farcy always terminates in glanders, unless arrested. Farcy commences with hard cord-like swellings of the lymphatic vessels and glands, called farcy buds, which suppurate and form fistulous ulcers, discharging sanious pus. But it must not be understood that glanders usually commences in farcy; it is most commonly primary. In glanders as well as in farcy the blood is deficient in red globules, and otherwise unfit to nourish the body. The respiration is weak, and there is cough, and usually the bowels are relaxed. It is said to be produced by continuous bad treatment, overcrowding in filthy and particularly in unventilated stables, and other causes which produce a depraved state of the system. English cavalry horses are said to have been affected with glanders from such causes in the Crimea in 1854. Glanders may be divided into three stages. In the first it is difficult to distinguish the disease with certainty. There is a continuous serous discharge from one or both nostrils, which becomes thick and glairy, like the white of an egg. Ulceration of the pituitary membrane is considered conclusive of its presence, but this may be so far up the passages as not to be seen. The discharge and cough may be the effect of nasal catarrh. A test is sometimes applied by administering three successive eight-ounce doses of aloes, allowing two or three days to elapse between the doses. A glandered horse will

have his symptoms much aggravated; while if cold is the cause, the symptoms will be improved, although the horse may be weakened. The enlargement of a submaxillary gland and its adhesion to the bone is usual. If the disease is glanders, the discharge increases, and becomes foul and offensive, and it is said peculiar. This is the second stage. In the third stage the nasal membrane attains a dull leaden color, the lips and eyelids swell, parts of the face may become gangrenous, and the animal may die in a few days with a putrid fever, or he may die more slowly, the disease spreading to the lungs and other parts of the body, producing unhealthy abscesses, emaciation, and hectic. According to Youatt, the distinctive symptoms are the continuous discharge and the adherence of the enlarged submaxillary gland. Sometimes the disease may last for years, if the animal is well fed and cared for. The form known as farcy is also not generally so rapidly fatal, and may sometimes be arrested and prevented from passing into glanders. The treatment in both forms consists in good feeding, tonics, disinfectants, and detergent washes and applications, particularly carbolie acid and creosote. The administration of iodine is generally beneficial in chronic cases.—When the disease is communicated to man, it is usually considered fatal. A small portion of the diseased matter from the nostril of the horse is sufficient to communicate it if it falls upon the mucous membrane, or upon an abraded surface of the skin. The disease may appear as either glanders or farcy, and either may be acute or chronic. Acute glanders begins with the symptoms of putrid poisoning, such as lowness of spirits, wandering pains, fever, furred tongue, great thirst, profuse nocturnal perspiration, great pain in the head, back, and limbs, and tightness of the chest. In a few days the symptoms increase in severity, with rigors and delirium; the perspiration becomes sour and offensive, and diarrhoea sets in. Diffused abscesses appear, commencing in red swellings, about the joints, especially the knees and elbows. The tongue becomes dry and brown, the throat ulcerated, attended by a low malignant fever. In 10 or 12 days from the commencement a dusky shining swelling appears on the face, extending over the scalp and closing the eyes. An offensive yellowish discharge, streaked with blood, flows from the nostrils, and a crop of hard pustules about the size of a pea appears on the face, and spreads over the neck and body; fresh abscesses form and suppurate, accompanied with delirium and tremors, and death ensues. The chronic form proceeds more slowly, attended with discharge from the nostrils, swelling of the nose and eyes, and emaciation, with profuse perspiration and abscesses near the joints. The distinctions between acute and chronic farcy are not very clear, although in the former the lymphatics leading from the point receiving the contagion become violently inflamed the sooner. The treatment of the

human subject should be conducted upon the same general principles as that of the horse.

GLANVILLE, or **Glanville**, **Ranulf de**, chief justiciary of England in the reign of Henry II., died in 1190. He was of Norman descent, signalized his valor under Henry II. in repelling the invasion of England by William of Scotland, accompanied Richard I. on the crusade, and perished at the siege of Acre. To him is ascribed the *Tractatus de Legibus Consuetudinibus Regni Angliae, Tempore Regis Henrici Secundi*, first published in London in 1554. Some of the manuscripts say only that it was written in his time, without ascribing it to him. The best edition is that by John Wilmot (1780); English translation by John Beames (1812).

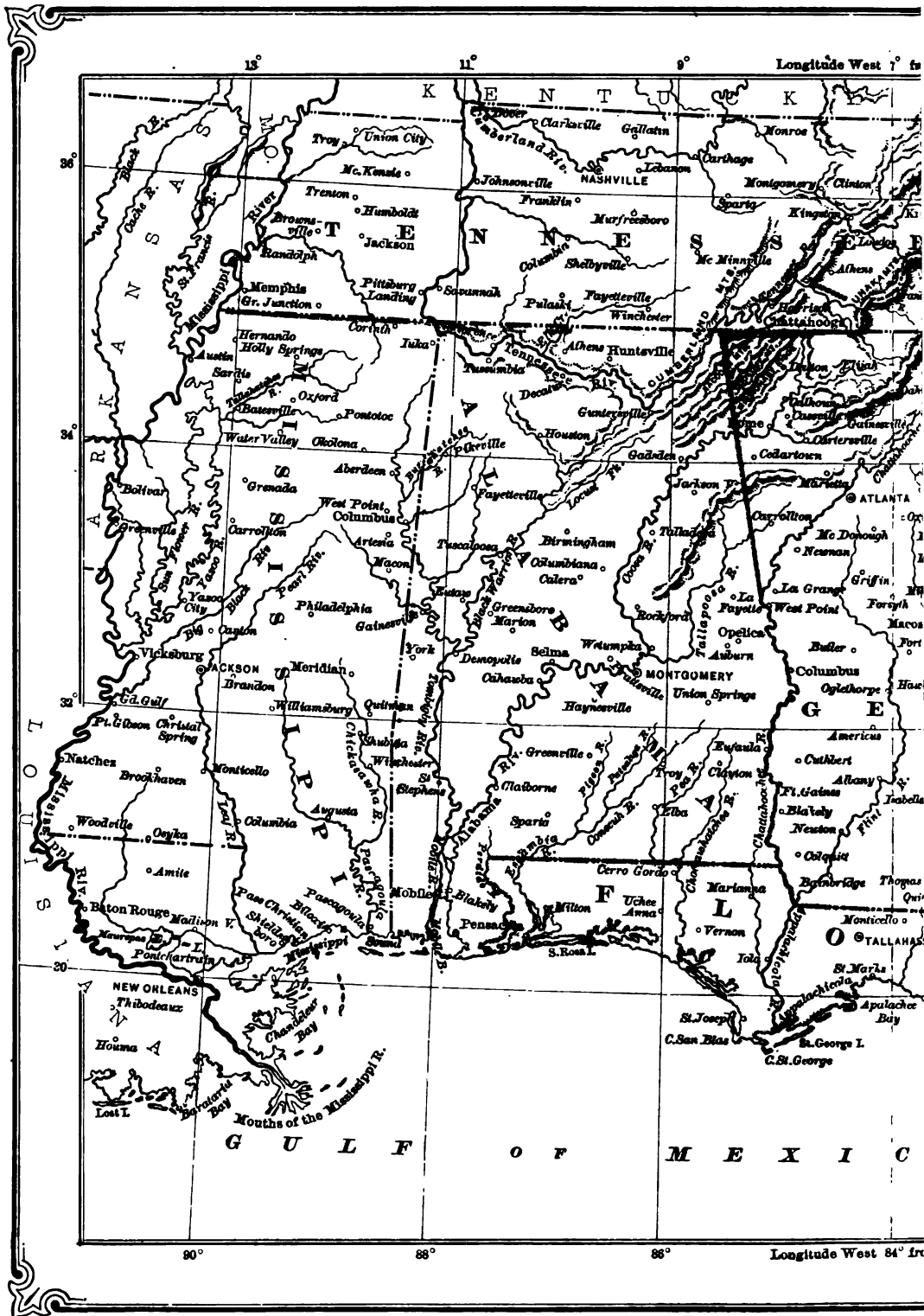
GLANVILLE, **Joseph**, an English divine and philosopher, born in Plymouth in 1686, died in Bath, Nov. 4, 1680. He was educated at Oxford, became a priest, and was made rector of the abbey church, Bath, in 1666. He became chaplain in ordinary to the king, and in 1678 was appointed a prebendary of Worcester cathedral. He is distinguished as an opponent of Aristotelianism, as a believer in witchcraft, and as the first writer in England who presented philosophical skepticism in a systematic form. His first work, entitled "The Vanity of Dogmatizing," was published in London in 1661, and an enlarged edition of it appeared in 1665, under the title of "Scep sis Scientifica, or Confessed Ignorance the Way to Science," with a dedication to the newly founded royal society, which body at once elected him a fellow. He made another attack on the ancient philosophy in his "Plus Ultra, or the Progress and Advancement of Knowledge since the Days of Aristotle" (1668), in which he exalted Bacon and Boyle and the inductive method. Notwithstanding his skepticism, he believed in sorcery and witchcraft, and wrote "Philosophical Considerations concerning the Existence of Sorcerers and Sorcery" (1666), the convictions expressed in which are repeated in his *Sadducismus Triumphans*, published posthumously (1681), with an account of his life and writings by Dr. Henry More. Among his other works are *Lux Orientalis* (1662), in which he treats of the preexistence of souls, following the views of Henry More; "Essays on several Important Subjects in Philosophy and Religion" (1676); "Essay on Preaching" (1678); and sermons edited by Dr. Horneck (1681).

GLARUS, or **Glaris**. I. One of the smallest of the Swiss cantons, bounded N. and E. by St. Gall, S. by Grisons, and W. by Uri and Schwytz; area, 267 sq. m.; pop. in 1870, 85,150, of whom 28,238 were Protestants and 6,888 Roman Catholics. Mountain chains occupy almost its entire surface; the principal one extends from the Hausstock to the Scheibe, and has an average height of 8,000 ft., but there are many separate peaks of much greater elevation. The Dödi or Tödi, nearly 12,000 ft. high, in the S. W. corner, is the loftiest mountain in eastern Switzerland. The principal valley, the Lin-

thal, extends N. and S. and forms the basin of the Linth, which, after receiving nearly all the other rivers of Glarus, discharges into Wallenstadt lake. There are many other lakes, mostly small, but remarkable for their romantic scenery. The Stackelbergerbod, a sulphurous alkaline spring at the foot of the Braunwaldberg, is much frequented. Not more than one fifth of the canton is susceptible of tillage. The most fertile land lies in the valley of the Linth, where grain and fruit, particularly cherries, are cultivated with success. Large herds of cattle, sheep, and goats are pastured on the mountains. With the exception of marble, slate, and gypsum, there are no minerals of much importance. Small quantities of coal are found, and there are ancient mines, now almost exhausted, of silver, copper, and iron. The principal kinds of timber are pine, beech, ash, maple, and chestnut. The most important manufacture is *Schabziegerkäse*. (See CHEESE.) The other manufactures comprise cotton, woollen, linen, and silk goods, prints, muslins, writing slates, and many articles in wood. An active trade is carried on with Germany and Italy, transportation being effected through a number of mountain passes, and by means of two canals which connect the Linth with the lakes of Wallenstadt and Zürich. Glarus enjoys a singularly democratic form of government, the supreme power residing in a general assembly of all the males 18 years of age and upward, who meet annually to elect magistrates and accept or reject the laws proposed by the executive council of 80 members. Taxation is very light, there are few crimes, and education is almost universal. The military contingent is about 1,800 men. The chief towns are Glarus, Mollis, and Schwanden.—The name Glarus is sup-

posed to be a corruption of St. Hilarius, in whose honor a church was built in this canton about 490 by an Irish monk called Fridolin, the founder of the convent of Seckingen on the Rhine. The upper part of the valley became the property of this convent, while the lower was dependent upon the nunnery of Schänis. It was afterward subject to bailiffs nominated by the house of Hapsburg, to escape from whose tyranny the inhabitants joined the Helvetic confederation in 1852, and in 1888 secured their independence by the famous victory of Näfels. Zwingli was curate of Glarus from 1506 to 1516. The introduction of Protestantism gave rise to many disturbances. **IL** A town, capital of the canton, situated in a secluded Alpine valley at the foot of Mts. Glärnisch and Schilt, on the left bank of the Linth, here crossed by two bridges, 33 m. S. E. of Zürich; pop. in 1870, 5,516. It contains a Gothic church, used by both Catholics and Protestants, a free school for 700 children, a new government house, an old town house, a bank, and a printing office. The streets are crooked and narrow, and the houses are fantastically painted. Cottons, woollens, muslins, and hardware are the principal manufactures. In 1861 the town was almost wholly destroyed by fire, which caused a loss of 8,000,000 francs. The environs are very picturesque.

GLASCOCK, an E. county of Georgia, bounded S. W. by Ogeechee river and drained by Rocky Comfort creek; area, 225 sq. m.; pop. in 1870, 2,786, of whom 819 were colored. The surface is level and the soil moderately fertile. The chief productions in 1870 were 8,831 bushels of wheat, 52,886 of Indian corn, 8,282 of sweet potatoes, 5,405 of peas and beans, and 1,894 bales of cotton. Capital, Gibson.



SUPPLEMENT TO VOLUME VII.

FAED

FAED. I. *John*, a Scottish painter, born in Kirkcudbright in 1820. He painted miniatures with success when scarcely more than a boy, and at the age of 21 went to Edinburgh to study, where some years later he exhibited pictures of humble life which gave him a reputation. In 1864 he settled in London. His best known works are: "Shakespeare and his Contemporaries," "The Cotter's Saturday Night," "The Soldier's Return," "Tam o' Shanter," "Catherine Sefton," "The Shooting Match," "The Stirrup Cup," "The Game-keeper's Daughter," "The Old Crockery Man," "John Anderson, my Jo," and "The Parting of Evangeline and Gabriel," illustrating Longfellow's poem. II. *Thomas*, a Scottish painter, brother of the preceding, born in Kirkcudbright in 1826. He studied at the school of design in Edinburgh, where he won many prizes. He at first devoted himself to water-color drawing, and exhibited "The Old English Baron," but afterward adopted oil painting as his profession, and has exercised his talents chiefly in genre. His works include "The Mitherless Bairn" (illustrating Thom's poem), "Home and the Homeless," "The First Break in the Family," "Scott and his Friends at Abbotsford," "Sunday in the Backwoods," "His Only Pair," "From Dawn to Sunset," "Baith Faither and Mither," and "The Last o' the Clan." Mr. Faed was elected a royal academician in 1864.

FAITHFULL, *Emily*, an English philanthropist, born at Headley rectory, Surrey, in 1835. She is the daughter of a clergyman, was educated at Kensington, and entered the gay society of London. But she soon became interested in the condition of working women, and has since devoted herself to their interests. In 1860 she set up a printing office in London, employing women as compositors. This establishment turned out some very fine work, and Miss Faithfull was appointed printer and pub-

FALK LAWS

lisher in ordinary to the queen. In 1863 she began the publication of "The Victoria Magazine," monthly, in which she advocated the claims of women to remunerative employment. In 1877 she started "The West London Express," which has proved so great a success as to demand the enlargement of the printing establishment. Miss Faithfull has appeared successfully as a public lecturer, and has published "Change upon Change," a novel, which has passed through several editions. In 1872-'3 she visited the United States.

FALK LAWS, a series of legislative measures carried through the Prussian parliament by the government in the years 1872-'5, which were prepared by the minister of worship, Dr. Falk. They were designed principally to transfer the direction of primary education in the Catholic provinces of Prussia from the clergy to the government, and also to secure the parish priests from arbitrary removal by the hierarchy for matters of belief. The dogma of papal infallibility, incorporated in the doctrines of the Roman Catholic church by the decree of the council of the Vatican in 1870, created more excitement in Germany than in other countries. Inside and outside of the Catholic church were awakened echoes of the old feelings of the reformation. After the conclusion of the Franco-German war and the consolidation of the empire, the German government found itself face to face with certain problems of policy arising from this question. These especially affected the Catholic provinces of Prussia, where the church and the state possessed joint powers in the direction of popular education and charities, by which arrangement the priests had become state officials, and the government had obtained a partial control over the ecclesiastical revenues. Impelled by the supposed dangers to national independence implied in the doctrine of infallibility, and feeling that the powers vested by the laws in the

clergy were repugnant to the Prussian theory of the state, and must prove a hindrance to the establishment of the Prussian system in the new empire, the government immediately entered upon a policy calculated to discredit the dogma of infallibility and render it practically void, by refusing to the hierarchy the right to discipline priests for its non-acceptance, and to divest the clergy of all rights and functions in the popular education. The imperial government, under the leading influence of Prince Bismarck, was not averse to inaugurating its career with an exhibition of vigorous policy which would be sure of general approval, and welcomed an opportunity for gratifying the feeling of nationalism by showing its power over the generally disliked Roman hierarchy, and thus diverting public attention from other questions which might arise to endanger the establishment of a powerful and concentrated national government. The courageous and sincere, but exceedingly impolitic, demeanor of the late pope, Pius IX., in this question, strengthened the hands of the Prussian administration, and emboldened it to put through sweeping reforms with confidence and rigor. —The first outbreak of hostilities was on the occasion of the suspension of a parochial teacher of religion by the bishop of Ermeland on account of his disapproval of the new dogma. Upon the action of the authorities in protecting him in the exercise of his office, a conference of bishops assembled at Fulda on Sept. 7, 1871, memorialized the king, and were answered that no disciplinary action based on the dogma of infallibility would be sanctioned until the matter was adjusted by a legislative provision. The Catholic division in the ministry of worship had been abolished in July, 1871. "Old Catholics" were sustained in the possession of churches and the tithes. The bishops paid no attention to the orders of the government, and were justified in their course by the provisions of the constitution of 1850. The Catholics of Prussia sympathized strongly with the church. An organized Catholic opposition, which developed later into the party of the centre, was formed by the election of 57 members to the first German parliament. The project of a law transferring the public education to the state was presented in December, 1871, by the minister of worship, Mühler, but its discussion was postponed. A different kind of man was felt to be necessary in this arduous situation. He was induced to resign, and on Jan. 22, 1872, the portfolio of religion, instruction, and sanitary affairs was given to Dr. Falk. The new minister, who was the son of a clergyman, and was born in Silesia in 1827, had made his way through the slow grades of the Prussian civil service, and distinguished himself as a jurist, having been intrusted more than once with the elaboration of important reforms in the administration of justice. On Feb. 13 the Mühler law on the supervision of schools was

passed in the house of deputies, and on March 8 in the upper house after a spirited contest with the eloquent representatives of the clerical party. The government, now that it had joined battle with the Roman church in the war of progress (the *Culturkampf*, as it was called), showed no hesitation in its reforms, but immediately assumed an aggressive and implacable attitude. A law was passed banishing members of the society of Jesus and kindred orders from the German empire. By an order of the ministry of June 15 members of ecclesiastical orders were incapacitated for teaching in the public schools. By an order of July 4 pupils of the secondary schools were forbidden to enter religious societies. The law requiring the inspectors of schools to be laymen was rigorously enforced. Cardinal Hohenlohe, who had been one of the leaders of the opposition to the dogma of infallibility in the œcumenical council, was nominated ambassador to the papal court, but was indignantly rejected by the pope. On June 25 the pope expressed his resentment in his reply to an address presented by German subjects, in which he uttered the warning that "a stone would yet roll from the mountain top to bruise the heel of the colossus." Upon the pope's characterizing the behavior of the Prussian government as "impudent," the secretary of legation representing that government at the papal court was at once recalled. —Dr. Falk devoted the whole energies of his mind to the formidable task he had undertaken, which involved a radical change in the ecclesiastical laws of the country, and a complete and fundamental reformation of the relations between the state and its subjects and the clerical authorities. In November, 1872, he laid before the diet a project of a law defining the limits of ecclesiastical authority in the discipline and punishment of members of the church. In January, 1873, he brought forward three other bills, designed to limit the authority of the bishops over the inferior clergy, to reduce the powers of the clergy over the laity, and to secure for the civil authorities the means of correcting refractory bishops and priests. All the four laws were passed, after a long and bitter contest with the ultramontane members, and went into effect in May, 1873, whence they are called the "May laws." They embrace provisions regarding the qualifications and installation of priests, regarding secession from the church and the disciplinary powers of the bishops over the clergy, providing for the institution of a royal ecclesiastical court for the adjudication of causes affecting the church, and defining the nature and limits of the punishments which the clerical authorities are permitted to administer. These laws conflicted with the articles of the constitution guaranteeing to the church the right to administer its own affairs. Amendments to the constitution were therefore proposed and adopted, which brought it into harmony with the new laws.

The bishops declared a passive resistance to the May laws, and paid no attention to their provisions. They ordained and removed priests without making the prescribed declarations to the civil tribunal, and refused to recognize the government inspection of their seminaries and convents. Many of these were closed by the authorities. The contumacious bishops were punished with fines; and the resolute Ledochowski, archbishop of Posen, was first deprived of his temporalities, and then ordered to abdicate. The government procured a law to be passed, enforcing a new form of oath to be taken at the investiture of bishops, by which they swore to observe religiously the civil laws. The Old Catholic Bishop Reinkens took the required oath, and was acknowledged as a Catholic bishop by the government and endowed with a revenue. In November, 1873, a new diet assembled, in which the centre counted 86 votes. If civil marriage was not a part of Falk's original programme, the great number of vacant cures which resulted from the enforcement of the May laws made it a necessity. An obligatory civil marriage law was passed, and published in March, 1874. Two laws were passed which stimulated the clericals to renewed opposition, one supplementary to the law on the qualification and ordination of priests, and one relating to the administration of vacant bishoprics and securing the state against the investiture of refractory bishops. In February, 1874, the inflexible Ledochowski was imprisoned for contumacy, and the episcopal property taken possession of by royal administrators, after the ecclesiastical tribunal had deposed him from his see. Bishop Martin of Paderborn was divested of his office and incarcerated by the same court. The archbishop of Cologne and the bishop of Treves also were imprisoned, and fines were imposed upon other bishops. The bishops rejected overtures from the government looking to a compromise. An intense feeling of alienation from the government spread among the Catholic population, one manifestation of which was the attempt upon the life of Chancellor Bismarck at Kissingen by the journeyman cooper Kullmann on July 13, 1874. The papal bull of Feb. 5, 1875, declared the May laws to be null and void, and forbade obedience to them. The pope also excommunicated the Old Catholics in a body, and bestowed a cardinal's hat upon Ledochowski. The "gag law" of April, 1875, was then passed, by which the bishops and clergy were required to sign a declaration of obedience to the laws before they could touch the tithes. A law was passed which proscribed all conventual orders and ecclesiastical societies in the Prussian dominions. By another law, trustees from the lay members of the parishes were given the control of the church property. When, in 1875, the programme of ecclesiastical and educational reform, which embraced also some changes modifying the position of the Protestant clergy

that were not wholly acceptable, was completed and strengthened by the necessary supplementary laws, the government assumed a defensive and expectant attitude, waiting calmly until the clergy should succumb to the new order. In 1877 only four of the twelve Prussian sees were filled—those of Kulm, Ermeland, Hildesheim, and Osnabrück. The bishoprics of Posen, Paderborn, Breslau, Münster, Cologne, and Limburg had been declared vacant by the ecclesiastical court; and those of Fulda and Treves were rendered vacant by the decease of their incumbents, and no successors had been appointed in accordance with the laws. On the accession of Leo XIII. to the papacy, Feb. 18, 1878, hopes were entertained that the unfortunate differences between the church and the Prussian government might be reconciled, and the deposed bishops and recalcitrant clergy restored to their cures. Repeated negotiations took place between the government and the holy see, but no basis for a compromise could be found, the exiled and disqualified prelates being as irreconcilable as ever, till June, 1883, when, after long debate, amendments were adopted which greatly modified the stringency of the laws.

FARJEON, Benjamin Leopold, an English novelist, born in London, May 12, 1833. His father was a Jew of French descent, and his mother was English. He received a liberal education, and at the time of the gold excitement went to New Zealand, and established a newspaper at Dunedin, which he continued to manage for five years. While in New Zealand he produced several dramas, and published a story entitled "Shadows on the Snow." In 1869 he returned to London, stopping to spend the summer in New York. His first novel that attracted attention was "Grif, a Story of Australian Life," which was published as a serial in "Tinsley's Magazine," and appeared in book form in 1871. His subsequent novels are: "Joshua Marvel" (1872); "London's Heart" (1873); "Jessie Trim" (1875); "Love's Victory" (1876); "Solomon Isaacs" (1877); "The Duchess of Rosemary Lane" (1877); and "The Bells of Penraven" (1879). His works have been published both in London and New York, and several of them have been translated into French and German. His Christmas stories are: "Blade o' Grass" (1872); "Golden Grain" (1873); "Bread and Cheese and Kisses" (1874); "An Island Pearl" (1875); "At the Sign of the Silver Flagon" (1876); and "The King of No-Land" (1877). Mr. Farjeon has dramatized "Grif," and has written several other plays which have been acted with success. He has also lectured in London. As a public reader from his own works, he is a special favorite with the laboring classes. In 1877 he married Margaret, eldest daughter of Joseph Jefferson, the actor.

FARRAR, Frederick William, an English clergyman, born in the Fort, Bombay, Aug. 7, 1831. He was educated at King William's college,

Isle of Man, at King's college, London, and at Trinity college, Cambridge. He was classical exhibitor of the university of London in 1850, graduated B. A. there, and was appointed university scholar in 1852. The same year he became a foundation scholar of Trinity college, Cambridge, graduated there in 1854, and was elected fellow in 1856. He carried off the chancellor's medal in 1852, the Le Bas prize essay in 1855, and the Norrisian prize essay in 1856. He became assistant master of Harrow school in 1855; honorary fellow of King's college, London, in 1858; fellow of the royal society in 1866; university preacher in 1868, 1874, and 1875; honorary chaplain to the queen in 1869; Hulsean lecturer at Cambridge in 1870; master of Marlborough college in 1871; chaplain in ordinary to the queen in 1878; canon of Westminster abbey in April, 1876; and rector of St. Margaret's the same year. Canon Farrar is a voluminous and popular writer. In fiction he has published "Eric, or Little by Little," "Julian Home," and "St. Winifred's." In philological and linguistic studies he has published "Origin of Language" (1860), "Chapters on Language" (1865), "Greek Syntax" (1867), and "Families of Speech" (1870). He is also well known for his productions in theology: "The Fall of Man and other Sermons" (1865), "Seekers after God" (1869), "Witness of History to Christ" (1871), "The Silence and Voice of God" (1873), "The Life of Christ" (2 vols., 1874), "Eternal Hope" (1878), and "The Life and Work of St. Paul" (2 vols., 1879). Several of these works have passed through many editions, and still hold their place in popular esteem. Canon Farrar has also been a contributor to Kitto's and Smith's dictionaries, and to periodicals.

FASTING. Cases of prolonged abstinence from food were recorded before the beginning of the Christian era, and fasts for long periods were apparently not uncommon among monks and hermits belonging to the various sects of the early Christian church. All these cases, together with the numerous examples of saints who practised partial or total abstinence from food at various times during the middle ages, are of course unauthenticated and often ridiculous. Liduine of Schiedam told some friars in 1422 that for eight years nothing in the way of nourishment had passed her lips. St. Joseph of Copertino was said to have remained for five years without eating bread, and for ten years without drinking wine, supporting life entirely upon dried fruits and bitter herbs. He fasted for 40 days seven times every year, eating nothing at all except upon Sundays and Thursdays. Nicholas of Flue, and a nun of Leicester, who was watched for 15 days by the clerks of Hugh, bishop of Lincoln, both claimed to live entirely upon the holy eucharist. Other saints who were supposed to have acquired the power of living upon sacramental bread were St. Catharine of Siena, St. Rose of Lima, St.

Collete, and St. Peter of Alcántara. Instances are also given by Görres of people possessed by devils who fasted from 20 to 70 days. In the 15th, 16th, and 17th centuries the religious fasters were succeeded by the "fasting girls," considered by scientists at present to have been remarkable cases of hysteria. Among them the most prominent examples were Margaret Weiss of Rode, near Spire, Apollonia Schreira of Bern, Katharine Binder of the Palatinate, Eve Fliegen of Meura, Joan Balaam of Constance, and a maiden exhibited at Cologne in 1595, who were all popularly believed to have fasted for periods ranging from three to fourteen years. But accidents have several times furnished trustworthy data in regard to fasting. In Belgium, in 1683, four colliers were confined in a coal pit for 24 days, and lived on nothing but water. Three women buried underneath an avalanche in Bergemolletta, Piedmont, lived from March 19, 1755, until April 18, upon a pint of goat's milk a day. Fodéré mentions the case of three workmen who lived 14 days in a cold, damp vault, without any food or any water except what was absorbed. Van Swieten reports the case of Guillaume Granet, a prisoner at Toulouse, who resolved to starve himself to death. After the first 7 days his sufferings compelled him to take water, but he endured for 58 days, when he died in horrible convulsions. Viterbi, a Corsican, starved himself to death in 21 days. Capt. Casey, of the James Lowden, passed 28 days in an open boat, without food or water, except as much rain water as he could collect. Dr. B. F. Stoddard published an account of a fast undertaken from religious motives by Calvin Morgan of Mystic, Conn., who abstained from food for 40 days—from Dec. 20, 1839, to Jan. 29, 1840. Mr. Morgan drank water freely throughout the fast, and up to the 15th day attended to many of his usual duties; after which time he became more quiet, and toward the end was much reduced. He recovered, however, without any permanent bad effects. Mr. Morgan was under no accurate supervision, but his unimpeachable character caused his fast to be popularly accepted. (For other cases of prolonged fasting, see **ABSTINENCE**.)—Two remarkable cases of alleged fasting have occurred in this century, which were exposed by means of scientific inquiry. About 1810 Ann Moore of Tetbury, England, claimed, and was currently believed, to be able to live without food. Persons who watched her for three weeks reported her as really abstaining; but, a stricter watch being set, the woman was reduced to the point of death in nine days, and confessed that her daughter had supplied her with food by washing her face with towels wet with beef tea and other nutritive preparations, and by conveying food from mouth to mouth when kissing her. The Welsh fasting girl, Sarah Jacobs, whom many believed to have lived without food, and in regard to whom there was much excitement in 1869, lived exactly eight days from the

time she was placed under systematic inspection. Perhaps the most curious modern instances of alleged fasting are those of Palma d'Orio, and Louise Lateau of Belgium, both of whom claim not only to live without food, but to have received the *stigmata*—i. e., to have been miraculously marked with the wounds received by Christ at the crucifixion. Both cases have been implicitly credited by the faithful of the Roman Catholic church, and utterly discredited by scientists, a committee of whom carefully examined Louise Lateau. Probably the best authenticated example of prolonged abstinence from food on record is that of Dr. Henry S. Tanner, an eclectic physician of Minneapolis, Minn., who fasted 40 days in New York—from June 28 to August 7, 1880. Dr. Tanner had frequently abstained from food for from 7 to 12 days, and in the summer of 1877 claimed to have fasted for 42 days, and thereby cured inflammation of the stomach and cardiac rheumatism. This fast was generally discredited. In the course of the next year Mollie Fancher of Brooklyn, N. Y., attained considerable notoriety on account of her alleged ability to live without food, and was offered \$1,000 by Dr. W. A. Hammond of New York on condition of abstaining from food for one month. This offer was not accepted by Miss Fancher, and Dr. Tanner came to New York to present himself as her substitute. Failing in this, however, he placed himself under the charge of eclectic physicians, who were subsequently joined by others of the regular profession; and his fast, though not rigidly conducted as a scientific experiment should have been, was generally believed and acknowledged by prominent physicians to be a genuine case of prolonged abstinence from food.—From the numerous credible instances of persons shipwrecked, buried in mines, suffering from disease, or otherwise prevented from taking food, the average duration of life without food has been placed at from 8 to 15 days, and without food or water at from 7 to 12 days. But no definite rule has been formulated by physiologists, who have generally admitted that the ultimate limit of existence without food is unknown. Water, however, has been found absolutely essential for the preservation of life beyond a comparatively short period. When no food is taken, and the vital functions still continue, a certain amount of force is required, which is obtained from the metamorphosis or consumption of the tissues of the body. These tissues are the products of food previously taken into the system and assimilated. Their oxidation is slow or rapid according to the intensity of thought, activity of the vital functions, and amount of muscular energy exerted. In the animal kingdom, fish, snails, chameleons, toads, frogs, lizards, and other cold-blooded animals have been observed under circumstances that left no doubt of the total deprivation of food for a very long time; while the familiar examples of hi-

bernating animals, with the attendant emaciation, indicate an ability to subsist for months upon the tissues of the body when in a semi-torpid condition. In human beings, as in animals, the consequent emaciation is constant in its occurrence, and its absence may be looked upon as a proof of fraud. A striking example of this reduction in weight was afforded by a hog that was buried under a chalk cliff in Dover in 1810. At this time the animal weighed 160 lbs., and when extricated, 160 days afterward, its weight had diminished to 40 lbs. It had nibbled the wood of the sty, and the sides of the cave looked smooth, as though the hog had continually licked them in order to obtain the moisture exuding from the rocks. Indian fakirs and persons in trances are able to live without other food than that supplied by their own bodies for very long periods, since the activity of the vital functions is reduced to the lowest possible point, this result being often attained among the fakirs by the use of opium and other narcotics. It has been found that the supply of fat in the body acts as a reserve of force-producing material, and it is therefore generally considered, other things being equal, that the greater the supply of fat the longer can life be sustained under abstinence from food. The great capacity of force-production residing in the tissues of the body is shown by the fact that one gramme (15.432 grains) of fat, as oxidized in the human body, will develop an amount of energy sufficient to raise 27,778 lbs. one foot, and in like manner one gramme of lean muscular fibre will raise 14,808 lbs. one foot. So far as any exact limit to the force-producing powers of the body has been fixed, it has been done by the experiments of Chossat and Brown-Séquard upon animals. It was found that when they were deprived of food, death ensued as a mean result when 90 per cent. of the fat of the body was consumed, or when the body lost two fifths of its original weight. A gradual but not extensive fall in temperature occurred during the first part of the enforced fast, and then the temperature fell more rapidly to a point 29° or 30° F. below the normal point, when a condition of torpor supervened, and death followed. In man, as in animals, the immediate cause of death from starvation is a decline in the animal temperature. Death is accelerated by cold, and delayed by the presence of moisture in the atmosphere. As would naturally be expected, mature adults endure deprivation of food for a much longer time than children and aged persons. From observations this positive rule has been laid down, that no person can exist without a supply of force which is obtained from the consumption of the tissues of the body; and though the body may to an extent be used up in providing this force, there is a limit beyond which it is impossible to go without the restoration of the tissues by food, or the occurrence of death.—The known cases of fasting may be divided into

voluntary and involuntary. The former class includes religious fasts, abstinence from food on the part of insane and hysterical persons, fraudulent fasts, and deliberate attempts at self-starvation; the latter embraces cases where persons have been prevented from obtaining food by circumstances, or from taking it by such diseases as inflammation of the stomach, stricture of the œsophagus, lockjaw, typhus fever, acute febrile diseases, and other disorders. Insane persons, especially those subject to melancholia, and hysterical patients, often take an aversion to food, and exist either on very small quantities or without any food at all for long periods; cases being cited of abstinence for from 18 to 61 days with nothing but water. Low cunning and a morbid tendency to deceit, often characteristic of hysteria, explain many fasts, otherwise miraculous, including some so-called religious fasts. Deceptive fasts also originate from a love of notoriety and a desire to gain some advantage, as in cases that have occurred in hospitals. Persons absolutely debarred from food have frequently lived 15 days or longer, though their suffering and emaciation were strongly marked. In June, 1880, a case was reported in New York of a woman suffering from inflammation of the stomach, who lived five weeks without food. In cases of involuntary fasting, of course mental disturbance and the ravages of disease tend to shorten life. Cases of prolonged inanition in the human subject have never been scientifically studied, owing to their comparative rarity and the obvious obstacles that exist. Dr. Tanner's fast, before alluded to, though not regarded as an exact scientific experiment, developed several interesting points. His total loss in weight during the 40 days was 86 lbs. As experience had usually shown, he suffered from actual hunger only during the first few days. His temperature remained nearly normal throughout, there being no marked decline, as is usual in cases of starvation. Besides the loss in weight, none of the characteristic symptoms of starvation appeared, with the exception of slight and temporary evidences of cerebral disturbance on the 15th day, and a hardly perceptible fetid odor in the breath toward the close of the fast. That water is absolutely essential to life was never better illustrated than by this fast. From the 3d to the 10th day Dr. Tanner took no water, except what was absorbed from towels and sponges and retained in gargling his mouth. On the 10th day, after undergoing severe mental excitement, he drank 4 oz., and then again abstained until the 16th day. At this time his appearance indicated intense suffering, and his condition was regarded as so precarious that his physicians seriously considered the advisability of supplying him with food. Forced by necessity, he drank water freely, and at once revived, seemed invigorated, and for a few days gained in weight. On the 25th day, however, water began to exercise an irritating influence upon his stomach. He was troubled with nau-

sea and vomiting, which continued at intervals until the close of the fast. He vainly tried hot water, and mineral and carbonated waters, and attempted to palliate his sufferings with alcoholic vapor baths and baths of mustard water. In the strictly technical sense, therefore, he might be said to have taken food. During the fast he drank 667½ oz. of water, and the average daily amount given off from the skin and exhaled from the lungs was calculated by Dr. N. S. Westcott to be only 11½ oz., an amount that forms a striking contrast to the quantity (from 30 to 40 oz.) given by Seguin, Valentine, and Lavoisier as the average daily loss from the lungs and skin of a male adult not fasting. Dr. Tanner had no passage from the bowels during the fast. The urates in the urine, representing the nitrogenous waste of the body, were found to decrease steadily. His fast possesses a certain value, as confirming the belief of physiologists in the necessity of water, and as showing that alleged instances of fasting without suffering or any symptoms of inanition are fraudulent. The case is also interesting as illustrating the power of the will over the body, and showing what human endurance can accomplish. But, in the opinion of distinguished physicians, no practical benefit can be derived from the fast, as the subject of fasting in relation to the treatment of disease had previously been exhaustively studied, and as no rule bearing upon the physiology or pathology of inanition can be formulated from one case. Though suffering greatly and much reduced at the close of the fast, Dr. Tanner rallied at once without any bad effects. Beginning with a peach, he drank milk and ate pieces of watermelon, which was shortly followed up with beefsteak, ale, and wine. Everything taken was retained upon his stomach. He gained 5 lbs. in the first 24 hours, and 8½ lbs. in the first 30 hours, after the completion of the fast. His rapid and perfect recovery was perhaps the most astonishing feature of the fast; and the fast itself was considered by physicians the most remarkable among authenticated instances. The fact that he had been previously accustomed to fast was taken to confirm the theory that the stomach may habituate itself to fasting or craving too little. Some novel medico-legal points were raised by this fast. It was held that in case of Dr. Tanner's death his watchers would be guilty of manslaughter.—See Wanley, "Wonders of the Little World" (London, 1806); Esquirol, *Des maladies mentales* (Paris, 1838); Görres, *La mystique divine, naturelle et diabolique* (translated from the German, Paris, 1861); *Les stigmatisées* (Paris, 1873); Chossat, *Recherches expérimentales sur l'inanition* (Paris, 1873); Fodéré, *Traité de médecine légale et d'hygiène* (new ed., Paris, 1878); "History of the Welsh Fasting Girl," Hammond, "Fasting Girls" (New York, 1879); *Louise Lateau, Rapport médical*; Pavy, "Food and Dietetics;" and Carpenter's "Physiology."

FITCH, Asa, an American entomologist, born at Fitch's Point, Washington co., N. Y., Feb. 24, 1809, died April 8, 1879. While studying in the Rensselaer polytechnic institute in Troy, which he entered in 1826, he conceived a passion for zoölogy, which gradually concentrated itself upon the investigation of insect life. He studied medicine in the Vermont academy of medicine at Castleton, in Rutgers medical college in New York, and in Albany. At the same time he learned all that had been written upon American insects. He accompanied Prof. Eaton in the capacity of assistant professor of natural history upon the Rensselaer institute expedition in 1830 to Lake Erie, where he left the party to make an extensive entomological expedition in the west. Upon his return in the following year he began the practice of medicine in the same office with Dr. Tayler Lewis, afterward professor of Greek in Union college, at Fort Miller, N. Y. He removed in 1832 to Stillwater, and in 1838 returned to Fitch's Point (Salem) to take charge of his father's business, giving up his profession. Engaged in agricultural pursuits, he was enabled to follow to better advantage his favorite investigations. He began in 1845 to publish in Dr. Emmons's "American Quarterly Journal of Agriculture and Science," and afterward in the "Transactions of the New York State Agricultural Society," essays upon subjects connected with economic entomology. In 1845 he published an article on the genus *cecidiomyia*, and afterward papers on the wheat midge, the Hessian fly, and winter insects. His paper on the currant worm in the "Transactions" first brought the author to the notice of the scientific men of Europe. He was employed some time in collecting insects for the state cabinet of natural history, and in 1854 was appointed state entomologist. Of his thirteen reports printed in the "Transactions of the State Agricultural Society," the first nine were collected and published separately. This work won a speedy recognition in the scientific world. Dr. Fitch had in view the preparation of a systematic work on entomology, which was never accomplished in the form intended; but at the time of his death as many as a hundred note books were found upon his shelves, to be published posthumously.

FITZGERALD, Percy Hethrington, a British author, born at Fane Valley, county Louth, Ireland, in 1834. He was educated at Stonyhurst college, Lancashire, and Trinity college, Dublin, was called to the Irish bar, and became crown prosecutor on the northeastern circuit. He has published biographies of Sterne, Garrick, Charles Lamb, and the Kembles; "A Famous Forgery," the life of Dr. Dodd; "Principles of Comedy," and "Proverbs and Comediettas;" "School Days at Saxonhurst;" "Autobiography of a Small Boy;" "Loves of Famous Men;" "Pictures of School Life and Boyhood;" "Romance of the English Stage;" and many novels, among which are "Never

Forgotten," "The Dear Girl," "Fatal Zero," "The Bridge of Sighs," "The Middle-aged Lover," "Mildrington the Barrister," "Beauty Talbot," "The Sword of Damocles," "Rev. Alfred Hoblush," "The Night Mail," "Diana Gay," and "Fairy Alice."

FLORIDA. Of the population of the state in 1880 (269,493), 136,444 were males, 133,049 females, 259,584 of native and 9,909 of foreign birth; 142,605 white, 126,690 colored, 18 Chinese, and 180 Indians. There were 61,699 males twenty-one years old and over, of whom 84,210 were white (80,851 native and 3,859 foreign) and 27,489 colored. Of persons ten years of age and upward, 70,219, or 88 per cent., were unable to read, and 80,183, or 43.4 per cent., were unable to write, including 19,024 native whites, or 20.7 per cent. of that class, and 60,420 colored persons, or 70.7 per cent. of that class. There were produced 54,997 bales of cotton, 8,174,234 bushels of corn, and 468,112 of oats; 1,273 hogsheads of sugar, 1,029,868 gallons of molasses, 1,294,677 lbs. of rice, 1,687,618 bushels of sweet potatoes; live-stock on farms, 22,686 horses, 9,606 mules and asses, 16,141 working oxen, 42,174 milch cows, 409,055 other cattle, 58,681 sheep, and 287,051 swine. There were 426 manufacturing establishments; capital, \$3,210,680; hands employed, 5,504; value of materials used, \$3,040,119; of products, \$5,546,448. The principal stock-raising counties, with the number of cattle in each, according to the tax books of 1881, are as follows: Manatee, 58,273; Brevard, 89,682; Monroe, 24,710; Polk, 22,082; Hillsborough, 21,223; Sumter (1880), 16,276; Hernando, 14,882; Volusia, 13,635; total for eight counties, 205,714. The number of bearing orange trees returned in 1880 was 292,324; oranges produced, 46,097,856. The yield of 1881 was about 80,000,000. The total receipts into the treasury on account of general revenue (including interest taxes) for the year ending Dec. 31, 1882, amounted to \$350,569.80. The amount of warrants and coupons paid at the treasury for the year ending Dec. 31, 1882, was \$289,693.68. The following is a statement of the bonded debt:

7 per cent. bonds of 1871.....	\$350,000 00
6 per cent. bonds of 1873.....	925,000 00
8 per cent. convention bonds.....	1,500 00

Total.....\$1,276,500 00

Of this indebtedness there is:

In sinking funds.....	\$159,500 00
In school fund.....	285,600 00
In seminary fund.....	87,400 00
In agricultural college fund.....	134,200 00

Total.....\$666,700 00

Leaving in the hands of individuals.....\$609,800 00

The table of assessment for 1882 shows that the taxable valuations amounted to \$45,285,977, a large increase since 1880. But more than \$3,000,000 of this was upon railroad property for which exemption is claimed. The state

taxes in 1882 were as follows: state tax, \$200,-827.28; sinking funds, \$91,531.95; school fund, \$45,382.71—total, \$337,691.94. The county taxes were: County tax proper, \$175,369.82; county school tax, \$135,235.42; county special tax, \$115,963.84—total, \$426,569.08. The number of schools in 1877 was 656, with 29,678 pupils; in 1880, 1,131, with 39,315 pupils; for the scholastic year beginning Oct. 1, 1882, 1,826, with 51,945 pupils. The principal of the common-school fund has increased, rising from \$246,900 in January, 1881, to \$328,535.42 at the close of 1882. It has been ascertained that nearly 80,000 acres of school lands were due from the United States. Selections amounting to 43,746 acres have been approved. Under the agricultural college grant Florida received 90,000 acres, which were sold for \$81,000. The proceeds of the sale were invested in \$100,000 of Florida bonds. The interest has been invested, and the fund now has an income of about \$9,000 per annum. As no portion of the fund nor the interest can be applied to building purposes, no institution has been established. On Jan. 1, 1881, there were 95 inmates in the insane asylum. During the two following years there were admitted 112; discharged, 50; died, 26; escaped, 8; readmitted, 5; in the institution Jan. 1, 1883, 128, of whom 38 were white males, 44 white females, 27 colored males, and 21 colored females. The East Florida railway company had the state convicts in charge during 1881 and 1882. It received the convicts at the several jails, paid all expenses after conviction, and, in addition, paid into the state treasury over \$6,000 for their services during the two years. The convicts have been let for the years 1883 and 1884 for the sum of \$9,200, the other conditions being the same as those in the railway lease. The number of convicts Dec. 31, 1880, was 129, which were handed over to the railway company; delivered to it during 1881, 101; discharged, 49; pardoned, 4; escaped, 13; died, 14; sentence commuted, 1; remaining, Jan. 1, 1882, 149; delivered to the railway company during the year, 69; discharged, 55; pardoned, 8; escaped, 5; died, 10; remaining at the close of the year, 135.—In January, 1881, Philadelphia capitalists negotiated a contract with the board of trustees of internal improvements for the drainage and reclamation of the lands lying south of township twenty-four, by affording an outlet for Lake Okeechobee, in consideration of receiving one half of the lands so reclaimed. The legislature in 1881 chartered the Atlantic and Gulf Coast Canal and Okeechobee Land company, who succeeded to all the rights under the contract. This company immediately had a series of surveys made to test the practicability of the proposed undertaking, and from these, and those made by the United States, under the direction of Gen. Gillmore, it was shown that Lake Okeechobee has an elevation of 22 feet above the Gulf of Mexico, and that Lake Tahopekaliga, the head-

waters of the Kissimmee river, has an elevation of 65 feet above the waters of the gulf. The work was begun by building powerful steam-dredges on the Caloosahatchee river and Tahopekaliga lake, the plan of operations being to open a canal from the Caloosahatchee river to Lake Okeechobee, and the cutting of a canal from Lake Tahopekaliga through to Kissimmee lake, then straightening Kissimmee river and cutting one or more canals from Okeechobee to the Atlantic coast, as well as the construction of subsidiary canals. The dredge upon the Caloosahatchee entered Lake Okeechobee on the 21st of December, 1882. Up to Dec. 1, 1882, the company report that they had expended \$98,777.40, and had constructed over 12 m. of canal, 22 to 35 ft. wide and 5 to 6 ft. deep. The canals will afford a great inland system of steamboat navigation from Kissimmee City through the Caloosahatchee to the Gulf of Mexico, 180 m.—The feasibility of forming an inland water communication from the mouth of the St. John's river to Biscayne bay, in the extreme southern portion of the state, 270 m., by utilizing the waters of Pablo creek and North, Matanzas, Halifax, and Indian rivers, has long been conceded. It took practical shape when under the general incorporation act, the "Florida Coast-Line Canal and Transportation Company," with a capital of \$500,000, was organized. Operations were begun in November, 1882.—In regard to railroads, the governor, in his message to the legislature of 1883, says: "Florida has every cause of congratulation in having more miles of railroad construction in her limits, in the last two years, than in her entire former history. West Florida, that has for so many years been cut off from direct communication with the remaining portion of the state, has now practically rail connection with our system of roads; and Pensacola, the queen of all gulf ports, as well as the interior western counties, will in a few weeks have direct communication with our Atlantic seaports. The Florida Southern has also completed and has in operation 100 m. of road. The road chartered from Live Oak to Rowland's Bluff has been finished to the latter point, and is vigorously pushing forward in the direction of south Florida. The roads from Waycross to Jacksonville, and from Fernandina to Jacksonville, have been completed. Jacksonville and St. Augustine will, in a short time, have a new road completed. The road from Waldo has been pushed on to Silver Spring and Ocala, connecting there with the Tropical, which is in operation as far south as Wildwood, Sumter co., with a branch graded and crossed from Wildwood to Leesburg. The South Florida road has been built from Orlando to Kissimmee City. The St. John's and Halifax, Palatka and Indian river, Green Cove and Melrose, and the Jacksonville, Tampa, and Key West roads, all have portions graded, and the former some 8 m. of iron laid."—The population of the principal places, by the census of

1880, was: Key West, 9,890; Jacksonville, 7,650; Pensacola, 6,845; Tallahassee, 2,494. See map at beginning of this supplement.

FORBES, Archibald, a British journalist, born in Morayshire, Scotland, in 1838. He served several years in the royal dragoons. Afterward he became a professional newspaper correspondent, and in the Franco-German war of 1870 accompanied the German army as representative of the London "Daily News," his letters to which gave him a high reputation. Since then he has been almost constantly in the field as correspondent of the same journal. He visited India during the famine of 1874, witnessed much of the fighting in the civil war in Spain, accompanied the prince of Wales on his tour through India in 1875-'6, and in 1876 went through the Servian campaign. He followed the Russian army through the campaign of 1877, and was present at the most important engagements, including the battle in the Shipka pass and the attacks on Plevna. In 1878 he travelled in Cyprus, and in 1879 visited the seat of war in South Africa. He has published in book form "Drawn from Life," a military novel, "My Experiences of the War between France and Germany," "Soldiering and Scribbling," a series of Sketches, and "Glimpses through Cannon-Smoke." In October, 1880, he entered upon a lecturing tour in the United States.

FORESTS, North American. Forests play an important part in protecting the earth's surface and in modifying the extremes of climate. Regions are forest-clad in proportion to their annual average rain-fall and temperature; the most continuous and luxuriant forests occur in equatorial regions, where winter is unknown and rain falls daily, as in eastern tropical America, Ceylon, and the East Indies. In drier and colder regions the forest is less luxuriant; it disappears entirely in the Arctic and Antarctic regions; in the tropics even the summits of high mountains are treeless from absence of sufficient warmth, as are also rainless regions like the great interior plains of the Asiatic and North American continents, and the western rim of South America, from drought. The forest, then, is dependent on rain-fall; and rain-fall is not, as is often erroneously supposed, dependent on the forest. There is no evidence that the removal of forest has decreased the annual average rain-fall in any extensive region, or that the increase of forest area has anywhere increased the average rain-fall. Apart from the material which forests supply, they are of inestimable value in securing a constant and equal flow of springs and rivers, through their power to prevent the rapid waste of rain-fall by too rapid evaporation and superficial flow. Water falling on a tract of land stripped of its covering of trees is rapidly evaporated by the summer sun, or in winter flows off over the surface of the frozen ground without penetrating it. In a sufficiently wooded region summer rain is protected from evaporation by the trees which

cover the ground, and, held as in a sponge, slowly percolates to the water-courses, while melting snow and winter rain gradually sink into the soil, which in the forest is never so deeply frozen as in the open ground. Forests, by the resistance they offer to the sweep of the wind, and because less extreme variations of temperature occur within their limits than in open plains, are important factors in regulating and equalizing climate. An area equal to 20 or 25 per cent. of any country should be preserved in permanent forest, in order to secure a constant supply of forest products for the use of its inhabitants, to modify and regulate the extremes of climate, and to insure the normal flow of springs and rivers. In mountainous regions it is essential to preserve in their natural condition the mountain forests. The total or partial removal of such forests causes the snow to melt rapidly and overflow the streams that rise in them. The beds of such streams, deprived of the protection which trees afford them, are gradually enlarged, forming torrents which carry into the valleys great masses of rock and earth, becoming every year more dangerous and destructive. The evil effects following the removal of mountain forests have been seen in Switzerland and in different parts of France and Germany, where immense losses of life and property have followed the destruction of the forests on the mountains of central Europe, and the consequent irregular and excessive flow of the rivers heading in them. In America less damage has as yet been done by such forest destruction; but the degradation of the California mountain forests, which protect an immense snow-fall and numerous large streams, is already a source of great danger. The forests of North America (that portion of the North American continent south of the territory of the United States will be omitted in this article, for the obvious reason that little scientific information exists in regard to its forests) are peculiarly rich in the number of species which they contain, as compared with the other great forest-clad regions of the north temperate zone. The continent of Europe contains 128 species of trees, representing 49 genera and 25 families, while in North America there are 412 species, representing 158 genera and 54 families. But as the semi-tropical arborescent species of the Florida coast have no equivalent in the European flora, they may be omitted from a comparison of the sylvas of the two continents. Thus reduced, the American forests contain 347 species, representing 110 genera and 37 families, or 172 per cent. more than the European forests. On the eastern coast of Asia, including Mantchooria, northern China, and extra semi-tropical Japan, there are, according to Asa Gray ("Forest Archaeology"), 168 arborescent species, representing 66 genera, while the Atlantic forests of North America contain 218 species, representing 87 genera. In making

such a comparison, however, it must be remembered that the Asiatic flora is still imperfectly known, and that the region in question is much less extensive than that occupied by the Atlantic forests of North America. The causes which led to the present distribution of the flora of the north temperate zone must be sought, as has been shown by Asa Gray, in the botany of the ante-glacial epoch. In the later tertiary period the climate of the Arctic region, judged by the fossil remains of the plants which then flourished there, could not have differed greatly from the actual climate of the middle Atlantic states. This circumpolar miocene flora, as the frigeration of the latest glacial period extended southward, was gradually pushed down by advancing cold to the southern portion of North America, southern Europe, and middle Asia, only to recede northward again with the gradual return of heat. But not all the species survived these changes of habitat. The condition of climate not being essentially different, regions which from their topography offered the easiest means of escape and return to the species of the northern miocene sylvia will be found to possess the greatest number of the descendants of these species. Eastern North America, with its mountain range running north and south, and bordered on the south by numerous semi-tropical and tropical islands, to which the plants which then inhabited the southern states might retire when driven out by more northern species seeking to escape excessive cold, offered peculiar advantages for the preservation of the miocene flora, and it will be seen that the existing Atlantic forests contain a much greater number of the arborescent descendants of that flora than exist on the whole continent of Europe or in Pacific North America. The origin of the Atlantic and Pacific forests, now so distinct in composition and especially in number of species, was undoubtedly identical—as the remains of species so local even at the present time, as *sequoia*, are found in the tertiary deposits of Greenland. It is, therefore, permissible to believe that the poverty of existing arborescent species in the Pacific forest, as compared with that of the Atlantic region, is due to topographical difficulties and to unfavorable conditions of climate and rain-fall encountered by the miocene species in their southern migration into western America. Many species whose descendants now flourish in the Atlantic forest were doubtless unsuited to ascend the high elevations composing a large part of the region west of the Rocky mountains. Others might well have been irrevocably lost in the Pacific ocean, the trend of the coast line south of 39° N., from northwest to southeast, at an angle of 80° to 60° with the meridian, affording no escape to plants pushed down to the coast from the north. The topographical and climatic conditions of eastern Asia are not unlike those of eastern North America. South of both these regions

numerous islands afforded a secure retreat, beyond the immediate influence of ice, for plants driven down from the north. It is not, then, remarkable that these two regions should bear a striking resemblance in the number and relationship of the arborescent species constituting their forests. The European miocene forest was, perhaps, not unlike in composition and variety the present Atlantic forest, judged by the palaeontological remains found in the deposits of the late tertiary period, which include two *sequoias* nearly identical with the existing species of California, *ginkgo*, *magnolias*, and many other species not represented in the existing European flora. This poverty of the European forests in species can only be explained by the topography of the European continent. It is traversed by mountain ranges running, not north and south, as in North America, but east and west; with the Mediterranean sea on the south, which during the glacial period was not restricted within its present narrow limits, but extended far eastward to beyond the Caspian, and perhaps northward to the Siberian sea. Species then moving southward had to pass the Pyrenees, the Alps, the Carpathian, and the Caucasus, standing directly in their path. Many could not have withstood the cold encountered in their attempt to ascend these mountains, while others, having passed over or around them, may well have been lost in the Mediterranean; and this is also true, no doubt, of species which in the ante-glacial period inhabited southern Europe south of the great mountain ranges. The frigeration of the whole northern portion of the globe would reduce the temperature of southern Europe, and force its indigenous plants to move southward along a path hopelessly barred by a sea almost destitute of islands. It appears, then, that regions of the north temperate zone should now be rich in arborescent species; first, when their topography was such as to afford the species of the circumpolar miocene forest a safe line of retreat southward before the gradual reduction of temperature which accompanied the glacial period; second, where subsequent conditions of climate, and especially of abundant and evenly-distributed rain-fall, were favorable to the development and spread of forest growth. Eastern North America and eastern Asia in their topography and climate have been favorable to the escape and development of the northern flora, and are rich in arborescent species. Western North America, where the ancestors of the present flora had exceedingly unfavorable climatic as well as difficult topographical conditions to overcome, is poor in arborescent species; while Europe, with its mountain barriers extending from east to west, has preserved still fewer descendants of its miocene forests. The continent of North America, considered in relation to the species composing its forest, may be divided into the Atlantic and the Pa-

cific regions. The former embraces the whole territory from the Atlantic coast to the eastern base of the Rocky mountains, and from Hudson's bay to the Florida keys and the Rio Grande; the latter, the region west of and including the central continental range of the Rocky mountains. These two forest regions, distinct in the character of the species composing them, and south of latitude 52° 30' N. separated by a broad, elevated plateau nearly treeless from lack of sufficient moisture to induce forest growth, are joined on the north by a forest belt extending from Labrador to Alaska, and containing a few species common to both the Atlantic and Pacific regions. At the south, a few species belonging to the peculiar Texano-Arizona flora of Mexican origin cross the continent from Texas to southern California, joining again the forests of the Atlantic and Pacific. Thus considered, the American forest is composed of two very distinct groups of species, widely separated by the treeless plains of the central and southern portions of the continent, but united on their northern and southern extremities by a few species common to the two regions. Of the 412 arborecent species, representing 54 families and 158 genera, of which the American forest consists, 291 species, belonging to 52 families and 141 genera, are found in the Atlantic region; while the Pacific forest contains but 153 species, representing 24 families and 55 genera. Thirty-two species are common to both the Atlantic and Pacific forests; of these, 6 species (*pyrus sambucifolia*, *betula papyrifera*, *salix longifolia*, *populus tremuloides*, *populus balsamifera*, *abies alba*) cross the continent at the north; 11 species, of Mexican origin (*condalia obovata*, *Eysenhardtia orthocarpa*, *prosopis juliflora*, *prosopis pubescens*, *acacia Greggii*, *sambucus Mexicana*, *fraxinus pistaciifolia*, *chilopsis saligna*, *morus microphylla*, *quercus Emoryi*, *yucca baccata*), enter the Atlantic and Pacific forests at the south. Three species of the Atlantic region (*ptelia trifoliata*, *sapindus marginatus*, *salix nigra*) extend into the extreme southern portion of the Pacific region. Four species (*negundo aceroides*, *celtis occidentalis*, *juniperus Virginiana*, and *crataegus tomentosa*) of the Atlantic forest are also widely distributed in the Pacific region. One species (*juglans rupestris*) of the true Pacific sylva reaches Texas and the Atlantic forest. One species of the Pacific forest (*juniperus occidentalis*) is represented in western Texas by a well-marked and rather distinct form. A single northern species (*populus tremuloides*), the most widely distributed North American tree, extends over the mountain-ranges of the whole continent. An examination of the composition of the Atlantic forest shows that of the 292 species of which it is composed 197 belong to the true American sylva, of probable northern origin; that the narrow forest belt of Florida south of Cape Canaveral and Cedar Keys contains 65 semi-tropical West Indian species, and that 29 spe-

cies of the Texano-Arizona flora are found in Texas. Of the 153 species comprising the Pacific sylva, 111 are of probable northern origin. Of these, 81 species are common to the coast and great interior mountain region, which contains but 15 endemic species. The following comparison of the genera of the Atlantic and Pacific forests shows the wide difference in their composition. The semi-tropical genera of Florida and the peculiar genera of the Texano-Arizona flora are omitted, in order to restrict the comparison to the forms typical of the true northern American flora, as generally understood:

GENUS.	Atlantic. No. species.	Pacific. No. species.	GENUS.	Atlantic. No. species.	Pacific. No. species.
Magnolia.....	7	..	Symplocos.....	1	..
Liriodendron.....	1	..	Halesia.....	2	..
Asimina.....	1	..	Fraxinus.....	6	8
Gordonia.....	2	..	Forestiera.....	1	..
Fremontia.....	..	1	Chionanthus.....	1	..
Tilia.....	2	..	Osmanthus.....	1	..
Xanthoxylum.....	2	..	Ostrya.....	2	..
Ptelea.....	1	1	Persea.....	1	..
Ilex.....	4	..	Sassafras.....	1	..
Cyrilla.....	1	..	Umbellularia.....	..	1
Cliftonia.....	1	..	Ulmus.....	5	..
Euonymus.....	1	..	Planera.....	1	..
Rhamnus.....	1	2	Celtis.....	1	1
Ceanothus.....	..	1	Morus.....	1	..
Æsculus.....	2	1	Maclura.....	1	..
Sapindus.....	1	1	Platanus.....	1	1
Acer.....	5	4	Juglans.....	2	1
Negundo.....	1	2	Carya.....	8	..
Rhus.....	4	..	Myrica.....	1	1
Robinia.....	2	1	Quercus.....	28	9
Cladrastis.....	1	..	Castanopsis.....	..	1
Sophora.....	1	..	Castanea.....	2	..
Gymnocladus.....	1	..	Fagus.....	1	..
Gleditsia.....	2	..	Ostrya.....	1	..
Cercis.....	1	..	Carpinus.....	1	..
Prunus.....	6	5	Betula.....	5	2
Cercocarpus.....	..	2	Ainus.....	8	3
Pyrus.....	4	2	Salix.....	5	11
Crataegus.....	12	8	Populus.....	5	5
Heteromeles.....	..	1	Libocedrus.....	..	1
Amelanchier.....	1	..	Thuja.....	1	1
Hamamelis.....	1	..	Chamaecyparis.....	1	2
Liquidambar.....	1	..	Cupressus.....	..	3
Cornus.....	2	1	Juniperus.....	1	3
Nyssa.....	3	..	Taxodium.....	1	..
Sambucus.....	..	1	Sequoia.....	..	2
Viburnum.....	2	..	Taxus.....	1	1
Pinckneya.....	1	..	Torreya.....	1	1
Vaccinium.....	1	..	Pinus.....	18	18
Andromeda.....	1	..	Picea.....	2	4
Arbutus.....	..	1	Tsuga.....	2	2
Oxydendrum.....	1	..	Pseudotsuga.....	..	1
Kalmia.....	1	..	Abies.....	2	7
Rhododendron.....	1	..	Larix.....	1	2
Bumelia.....	8	..	Sabal.....	1	..
Diospyros.....	1	..			

Forty-eight genera, then, of the Atlantic forest have no arborecent representatives in the Pacific region. *Cercis*, *amelanchier*, *vaccinium*, and *rhododendron* are, however, represented by shrubby Pacific species. Thirty-one genera are represented in both the Atlantic and Pacific forests, while only 12 Pacific genera (*fremontia*, *ceanothus*, *cercocarpus*, *heteromeles*, *sambucus*, *arbutus*, *umbellularia*, *castanopsis*, *libocedrus*, *cupressus*, *sequoia*, *pseudotsuga*), are unrepresented by trees in the Atlantic forest, although *ceanothus* and *sambucus* have shrubby representatives in the Atlantic flora. Of these 12 genera, *fremontia*, *sequoia* and *pseu-*

Wisconsin, and Minnesota are now the great lumber-producing regions of North America, yielding over 7,000,000,000 ft. annually of merchantable pine. The white pine forests are rapidly disappearing, however, before such enormous drains. Of the natural divisions of the Atlantic region, the great southern maritime pine belt is next in economic importance to the northeastern white pine forests. This belt extends uninterruptedly, with the exception of the Florida peninsula, south of latitude 29°, and of the broad bottoms of the lower Mississippi and other rivers, from Virginia, in about latitude 38°, to the Brazos river in Texas. The characteristic tree of this region is the southern or long-leaved pine (*pinus palustris*). The low and often wide river bottoms of this region are covered with a dense growth of deciduous trees, the largest and most important of which is the bald cypress (*taxodium distichum*). Numerous low, swampy tracts, known as bay galls, densely covered with evergreen bays (*persea carolinensis*), magnolias (*magnolia glauca*), titi (*cyrtilla racemiflora* and *Cliftonia ligustrina*), and other secondary trees, are scattered through this open pine forest. The low, sandy plains, often extending 100 m. from the coast, with the exceptions above mentioned, are almost exclusively covered with the long-leaved pine. The loblolly or old field pine (*pinus taeda*), a species having little economic value, is sometimes associated with the long-leaved pine. This species occupies lower ground, often inhabiting swamps, or springs up on land exhausted by cultivation or fire. Farther from the coast, where the land is higher and often slightly rolling, oaks and a short-leaved pine (*pinus mitis*) are associated with the long-leaved species. The great value of the long-leaved pine as a timber tree has given rise to an immense lumbering industry along the whole southern coast. The turpentine and naval stores manufactured in the United States are produced from the long-leaved pine. The turpentine industry, formerly confined to North Carolina, has now extended south to Florida, Alabama, and Mississippi. The live oak (*quercus virens*), whose hard, solid, and very strong wood was once highly prized in ship-building, is a characteristic tree of the forest of the southern Atlantic and Gulf coast. It extends from Virginia to the Rio Grande, occupying the low, rich hummocks of the coast and islands. In Texas, the live oak extends northward and westward over large portions of the western part of the State, probably reaching its southwestern limit in the mountains of northern Mexico in about longitude 104° W. Except on the coast, however, it is of small size and inferior quality. With the exception of the pine belt of the north, with its long southern extension along the Alleghany mountains, and the maritime pine belt of the south, with a northern extension into Arkansas and southern Missouri of the short-leaved pine forest of Louisiana and eastern Texas, the forests of the Atlantic region

are principally composed of broad-leaved trees. This forest, rich in valuable timber trees, extends from the Atlantic to beyond the Missouri river. West of the Missouri river it becomes less dense with the gradual rise of the wide, high plateau which forms the eastern base of the Rocky mountains. West of longitude 97° it is reduced to a narrow fringe of trees along the rivers, reaching its extreme western limit on the eastern slopes of the Black hills of Dakota, and in the western part of the Indian Territory in about longitude 100° W. East, however, of this wide, treeless plateau, between latitude 40° and 44°, great prairies exist, forming bays in the western edge of the forest. The cause of these treeless prairies has given rise to much discussion. The amount of rain falling on them is sufficient to insure forest growth, and the soil is admirably adapted to the growth of trees. Whatever cause may have originally produced them, the fact that they have decreased in extent through the gradual pushing out of the forest over land once treeless, since agricultural occupation and the decrease of the annual fires which formerly swept over this region, seems to indicate that their continuation, at least, is due to accidental rather than natural causes. There is every reason to believe that at the time of the discovery of the Mississippi river the open prairie extended much farther south in Missouri than at present, and that many treeless valleys, since densely forest-covered, existed in Pennsylvania and Virginia. These valleys were, without doubt, burned over annually by the Indians, to encourage the growth of grasses and improve their hunting; but with the disappearance of the Indians, fires became less frequent and destructive, and the forest gradually occupied the whole country. The Atlantic forest reaches its greatest development in number of species in western Florida. Here, in the undulating hilly region, between the Chipola and Oklawaha rivers, which may be considered the extreme southern point of the Appalachian mountain system, in an area of a few square miles, are crowded together 96 species of trees. The greatest average development of the largest number of species is found in the rich alluvial bottoms of southern Arkansas. Forests of great beauty, rich in magnificently developed specimens of a great number of species, clothe the southern Alleghanies of the Carolinas, Tennessee, and Georgia. Less rich in species, but not less beautiful, are the forests of the "bluff formation" of Mississippi and western Louisiana, where the evergreen magnolia (*magnolia grandiflora*), the water oak (*quercus aquatica*), and the American beech (*fagus ferruginea*) attain their greatest development. The deciduous forests of the Atlantic region possess many trees of great economic value. They contain 23 species of oak, of which the white oak (*quercus alba*), the burr oak (*quercus macrocarpa*), the chestnut oaks (*quercus prinus* and *quercus prinoides*),

and the cow oak (*quercus Michauxii*) are among the most valuable; 8 species of hickory, a genus exclusively confined to this region, and of great economic importance on account of its timber and the edible nuts furnished by several of the species. The valuable black walnut (*juglans nigra*); the catalpas; birches; the nyssas, a genus peculiar to this region; the liquid-ambar, the sassafras, seven magnolias, the locust (*robinia*), and the sycamore (*platanus occidentalis*), its largest tree, give value and variety to the forests of the Atlantic region. The narrow belt of semi-tropical forest confined to the keys and hummocks of southern Florida is of little economic or commercial value. The species of which it is composed here reach their extreme northern limit, and are generally smaller than in the West Indies, and of inferior quality. Among the most valuable trees of this region are the mahogany (*Swietenia mahagoni*), the lignum vitae (*guaicum sanctum*), the red mangrove (*rhizophora mangle*), bordering with almost impenetrable thickets the saline shores of rivers and bays, and furnishing a wood valuable in its ability to resist the attacks of the *torpedo*; and the mastic (*sideroxylon mastichodendron*), a large tree, valued in ship-building. The beautiful royal palm (*oreodoxa regia*) is the most stately plant of this region. The cocoanut, the wild orange, the guava, and other tropical plants, have become naturalized through the agency of man, and now form part of its forest growth. The forests of the Pacific region, composed almost entirely of coniferous species, are largely confined to the mountain ranges, the valleys being often entirely, although not invariably, destitute of trees. They reach their greatest development in Washington and Oregon west of the Cascade mountains, and on the western slopes of the Coast Range and Sierra Nevada of California. They disappear entirely from the California coast south of latitude 35°, from southeastern California and western Arizona, and are stunted, scattered, and confined to the high mountain cañons and slopes of all the dry interior region inclosed between the Cascades and the Sierra Nevada on the west and the Rocky mountains on the east. The forests of the Rocky mountains, although much less dense and varied than those which cover the California Sierras, are of considerable importance and great local value. The Pacific forests extend northward to within the Arctic Circle. In the valley of the Yukon, in latitude 65°, the white spruce, the canoe birch, and the balsam poplar become trees of considerable size. The forest of the interior of Alaska is scanty and still imperfectly known; in latitude 63°, at Fort Selkirk on the Yukon, the twisted pine (*pinus contorta*), probably the most northern of the exclusively Pacific species, occurs. On the coast, considerably to the north of latitude 55°, several species peculiar to the Pacific forest appear. Sitka and other Alaskan islands are heavily timbered with the tide-land spruce

(*picea Sitohensis*), the western hemlock (*tsuga Mertensiana*), the twisted pine, the western arbor vitae (*thuya gigantea*), and the Sitka cedar (*Chamaecyparis Nutkaensis*). The last attains its greatest development on these islands, ranges southward along the Coast Range, and reaches its southern limit in the high Cascade mountains south of the Columbia river, in Oregon. It is the characteristic tree of the Alaskan coast forest, and one of the most valuable of North America, producing hard, very compact, and beautiful wood, of great utility in the arts. About latitude 55° N. the yellow fir (*pseudotsuga Douglasii*) first appears. The great value of its timber and its wide geographical range make the yellow fir one of the most important trees of the North American forest. It extends over a large portion of British Columbia, from the coast to longitude 115° west, and south through western Washington territory and Oregon, and along the Coast and Sierra ranges of California to the extreme southern limit of forest growth in California. It is the most valuable timber tree of the mountains of eastern Washington territory, Oregon, Idaho, and Montana west of the continental divide. It is common at low elevations throughout the Rocky mountains of Utah, Colorado, and New Mexico, and in northern and eastern Arizona, and extends south into northern Mexico. The yellow fir reaches its greatest development on Puget sound and the Oregon Coast Ranges, there forming forests unsurpassed in density by those of any other region of the north temperate zone, with the single exception of the sequoia forests of California, individual trees often attaining a height of 200 to 300 ft., with a diameter of 5 to 12 ft. The wood of the yellow fir is hard, strong, and rather coarse-grained, furnishing excellent material for ship-building, all kinds of construction, masts, spars, and railway-ties. Next to the yellow fir the most important tree of the Pacific forest, in extent of range and economic value, is the yellow pine (*pinus ponderosa*). This tree first appears in about latitude 51° N., here occupying the dry interior region between longitude 119° and 122°, and a second long, narrow belt on the 116th meridian. The yellow pine does not occur in Washington and Oregon west of the Cascade mountains, except on a few small local deposits of drift. From the eastern slope of the Cascades, however, it extends east to the Black hills of Dakota, and south through the California and Rocky mountains to Colorado, New Mexico, western Texas, and Arizona, where, in the San Francisco mountains and the forest belts of the eastern part of the territory, the yellow pine is the prevalent and most valuable timber tree. The yellow pine produces strong, coarse-grained wood, valuable for all kinds of construction, railway ties, fuel, &c. The western arbor vitae (*thuya gigantea*) reaches its greatest development in the forests of Puget sound and the Oregon

coast, here often reaching 200 to 300 ft. in height, with a trunk 10 to 15 ft. in diameter. This valuable species is also widely distributed along the western slopes of the Cariboo, Cabinet, Cœur d'Alène, and other western ranges of the northern Rocky mountains. With it are associated the western hemlock (*tsuga Mertensiana*), the largest of the genus, and in the interior northern forests the western larch (*larix occidentalis*). This tree, just reaching the western slope of the Cascade mountains, is otherwise confined to the northern interior region. It far exceeds in size and in the value of its timber its Atlantic, European, or Asiatic congeners. The twisted pine, the Pacific representative of the Atlantic *P. Banksiana*, is the characteristic tree over the southern part of the interior plateau of British Columbia, where it covers immense areas. An allied species (*P. Murrayana*) extends from the Blue mountains of Oregon, where above 6,000 ft. it forms extensive forests, over all the northern mountains to eastern Montana. The dense pine forest of the Yellowstone region is almost exclusively composed of this species, which extends also southward through Colorado and along the Sierra Nevada to southern California. The western white pine (*pinus monticola*), the representative of the Atlantic *P. strobus*, is of considerable local importance in the interior northern forests. This species reaches the coast of southern British Columbia, extends southward along the high mountains to the California Sierras, and eastward to the western ranges of the Rocky mountains, forming extensive and important forests on the eastern and western slopes of the Cœur d'Alène and other northern ranges. South of latitude 43° the forests of the coast change in character. The coast may, in this connection, be extended to include the region between the Pacific and the summit of the Sierra Nevada, in distinction from the drier and less heavily forest-covered region of the interior, including the Rocky mountains proper. Many of the peculiar California trees first make their appearance south of latitude 43°. The valleys are often covered with heavy growth of the California laurel (*umbellularia Californica*) and the great-leaved maple (*acer macrophyllum*), in addition to the cottonwoods and willows which line the streams throughout the Pacific region. The oak (*quercus Garryana*) of the British Columbian and Washington coasts is here joined by other species. The most valuable of the Pacific oaks, the California live oak (*quercus chrysolepis*) and the chestnut oak (*quercus densiflora*), reach here their northern limit. The oaks of the Pacific region are of small economic importance, with the exception of these two species, the former nearly equalling the Atlantic live oak in the value of its timber, the latter prized for its bark, rich in tannin. Several of the California oaks, however, attain a great size and are the char-

acteristic and often the only trees of the interior park-like valleys of central California. In latitude 43° also, the sugar pine (*pinus Lambertiana*) first becomes common. This magnificent tree, the largest of the genus, extends over southwestern Oregon and northern California, and thence southward along the Sierra Nevadas to the extreme southern part of the state, characterizing the important forest belt which covers their western slopes between 4,000 to 8,000 ft. elevation. Among American pines the wood of the sugar pine is second only to that of the Atlantic white pine for the special uses to which white pine is applied. On the coast of southern Oregon, just south of Umqua bay, a heavy growth of the Port Orford cedar (*chamaecyparis Lawsoniana*), mixed with yellow fir, gives great economic value to the forests of this region. This species, which attains a great size, is confined to a region some 50 m. long and 20 wide, with a few isolated outposts in the valley of the upper Sacramento, in northern California. The Port Orford cedar is only surpassed by its congener the Sitka cedar in the beauty and value of its durable, aromatic wood. Just south of the Oregon line the forests of red-wood (*sequoia sempervirens*) extend southward along the California coast almost continuously to latitude 37°. This tree occupies the sides and bottoms of the cañons and gulches facing the ocean, and within its direct influence. It hardly, if at all, crosses the Coast Range, and never extends more than 85 m. from the coast. The red-wood forest is probably surpassed by no other in productiveness. In favorable localities more than 200,000 ft. to the acre of merchantable lumber stand over considerable areas. Situated as these forests are within easy access to tide-water, and producing in immense quantities a soft, easily worked, and durable timber, they are economically the most valuable of the North American continent. The second species of sequoia (*sequoia gigantea*), the "Great Tree" of California, is confined to the western slopes of the southern Sierra Nevada. The northern limit of this tree, is found in Calaveras co. Here in the sugar-pine belt, at an elevation of 4,759 ft., an isolated grove exists. Similar groves, often widely separated, extend southward for 200 m. In Tulare and Kern cos. a forest 80 m. long, and often 6 or 8 m. wide, contains the only continuous body of this species, which, widely distributed through the miocene Arctic and European forests, has survived the later geological changes to which the earth's surface has been subjected. South of latitude 44° the forests of the interior region are of little value. Junipers, and two peculiar species of nut pine (*pinus monophylla* and *pinus edulis*), supply scanty fuel. The upper cañons of the mountains are sometimes heavily timbered with pine and spruce. A characteristic tree of the region between the Sierra Nevada and the Rocky mountains is the mountain mahogany (*cercocarpus ledifolius*),

a small tree yielding an exceedingly hard, brittle wood, highly prized for fuel. The most valuable timber tree of the central Rocky mountains, Engelmann's spruce (*Picea Engelmanni*), forms, at an elevation of between 8,500 and 12,000 ft. above the sea, extensive forests of great beauty and local importance. The Texano-Arizona forests, or rather the Mexican species which form the stunted and scattered growth of the dry and barren valleys and low, detached mountain ranges of the extreme southern portions of the United States, are confined in Texas to the southern and western portion of the state, and to the southern portion of New Mexico, Arizona, and California. The most important species of this group, the mesquit (*Prosopis juliflora*), extends from the Gulf of Mexico nearly to the shores of the Pacific. The wood of the mesquit furnishes admirable fuel and a practically indestructible building material; while its long and abundant pods, rich in sugar, yield nutritious forage to all grazing animals. The mesquit, within the limits of the United States, reaches its greatest development in the valleys of southeastern Arizona, here forming a tree nearly 50 ft. in height with a trunk 18 to 24 in. in diameter. In western Texas, where the yearly burning of the prairie grass prevents the growth of more than annual shoots, the roots of the mesquit attain immense development, and yield the only fuel of the region. Here the anomaly is seen of a single slender stem, a few feet only in height, springing from roots often several tons in weight. Such growths of the mesquit are locally known as "underground forests." Several peculiar oaks and pines of Mexican origin cover the mountains of southern New Mexico and Arizona. Various arborescent yuccas characterize the Texano-Arizona flora. Of these the largest (*yucca brevifolia*) forms a forest of considerable extent on the Mohave desert of southeastern California, where also a noble palm (*Washingtonia filifera*) is sparsely distributed. The most magnificent plant, however, of this southern flora, is the *suarrow*, or giant cactus of southern Arizona (*cereus giganteus*), the largest representative of the family, its great, bare, fluted columns often attaining 60 ft. in height. Taken as a whole, the Texano-Arizona flora, with the exception of the mesquit, contains no arborescent species of first-rate economic importance.

FORTUNY, Mariano, a Spanish painter, born at Rens, in Catalonia, June 11, 1838, died in Rome, Nov. 21, 1874. The lithographs of Gavarni, which Fortuny (who had painted altarpieces but developed no decided style) first saw in 1855, set him to studying the life of the people. He began with ardor the practice of sketching popular types, which he sought in the streets, in the theatre, and wherever he could find interesting subjects. In 1857 he won the Rome travelling pension. In 1860 he was commissioned by the municipal authorities of Barcelona to accompany the Spanish military

expedition to Morocco, and make studies for compositions to commemorate the campaign. His friends remarked a surprising development in the innumerable sketches which he took in Africa, and which were of great value to him in his later works. In 1861 he painted the "Negro's Head." His painting of the "Battle of Tetuan" was left unfinished at his death. In 1863 he returned to Rome. Fortuny at this time began to make etchings, and produced oil paintings and aquarelles in greater numbers, most of them being single figures and slight subjects of the nature of studies, though their execution was careful and complete. In 1863 he had an attack of miasmatic fever, which sapped his robust constitution and finally carried him off at an early age. In 1866 he went to Paris, where his work was brought before the public in such a way by Goupil that his pictures afterward realised large sums, instead of the low prices he had been obliged to take from a few discerning admirers. In 1868 he married a sister of the painter Madrazo. Fortuny's finished works are few, on account of the extreme thought and pains which they cost him; but his studies and water-color drawings, and even his etchings, are so full of force and original beauty that they are highly prized. Of all the painters of the new Spanish school, from which has issued one of the most genuine and vigorous art movements of the 19th century, none approaches Fortuny in power and thought; and few artists of any age have possessed so keen an instinct for the picturesque in form or in color. Fortuny's best pictures include: "A Spanish Marriage," "The Sword Sharpener," "The Tamer of Serpents" (in the A. T. Stewart collection, New York), "A Morocco Fantasia," "The Print Collector," and "The Academicians of Arcadia."

FRANCIS, Joseph, an American inventor, born in Boston, Mass., March 12, 1801. He has been devoted to boat building from his boyhood. At the age of 10 he exhibited a fancy boat at a fair, and at 18 received from the Massachusetts mechanics' institute the first prize for a fast row boat. He afterward established a boat yard in New York. In 1830 he built the first boat for the New York boat club. This was subsequently presented to the emperor of Russia, and replaced by a handsomer one, the *Seadrift*, which Mr. Francis constructed entirely by his own hands. This craft is 80 feet long, of chestnut oak, panelled with ebony, rosewood, and mahogany, and put together with copper rivets. Soon after this he built a four-oared race boat, to take part in a regatta at Quebec, the first American boat that had competed in a regatta with foreign-built boats, and she came off victorious. She was of Spanish cedar, 80 ft. long. Mr. Francis built a Venetian gondola, for use on the Hudson river, which was afterward transferred to Greenwood cemetery. He next invented a portable boat that could be taken apart and put together in a few minutes with

screws; and also a method of building boats over a frame or mould, with inch-square strips of cedar nailed edge to edge. But his greatest achievements have been in the construction of life boats. These began with experiments on wooden life boats, and culminated in the invention of the corrugated metallic life car. After overcoming many difficulties in the production of efficient dies, he completed his first life car in 1844. In 1845 he obtained patents in the United States, England, France, Germany, and Russia, for his method of constructing vessels of corrugated sheet metal, and for the machinery whereby they were produced. Life boats built on this principle were furnished for the Dead sea and Arctic expeditions, to the war, navy, and treasury departments, and to several European governments. One of his life cars was placed on the coast of New Jersey, near Long Branch, in 1849. In January, 1850, the ship *Ayrshire* was wrecked on Squan beach in a storm, and of the 201 persons on board 200 were saved by means of this life car. One man, who insisted on attempting to ride through the surf on the outside of the car, when his children were inside, was lost. This car is still preserved in the museum at Central park, New York. Mr. Francis has extended the application of corrugated metal to the building of steamers, floating docks, harbor buoys, and pontoon wagons. Among his inventions are a military hood for the protection of sentinels in a storm, a circular yacht, and a double-joint rowlock. He has received numerous medals and decorations from European sovereigns. He now (1888) resides at Tom's River, N. J.

FREYCINET, Charles Louis de Sauleas de, a French statesman, born at Foix, Nov. 14, 1828. He was educated at the polytechnic school of Paris, graduated in 1848, and was engaged as a government engineer. From 1856 to 1861 he was chief manager of the railroads of southern France, and his powers as an organizer proved so great that his system was adopted by all the French railroads. He published at this time treatises on mechanics and railroad engineering, which are now used as text books. He took up the study of sociology and political economy, and was commissioned by the French government on various scientific and industrial missions at home and abroad. His work on the labor of women and children in English factories was crowned by the academy in 1869; and through his efforts the laws of France were amended in the interest of working women and children. He also devoted much attention to the sanitary management of cities. In 1864 he received the rank of an ordinary engineer of the first class, and when the Franco-Prussian war broke out he was a member of the general council of the department of Tarn-et-Garonne. Later he became prefect of that department; and when Gambetta came into the provinces in October, 1870, as leading minister of the outer delegation of the government of

national defence, he intrusted Freycinet, at Tours, with the supreme control of the war department. In this capacity Freycinet rendered immense services to the country in the improvisation of armies. At the conclusion of peace he retired to private life, and wrote *La guerre en province pendant le siège de Paris*, 1871. In January, 1876, he was elected to the senate from the department of the Seine, being one of Gambetta's candidates. He was minister of public works in the cabinets of Dufaure and Waddington; and when Waddington's ministry was broken up in December, 1879, Freycinet succeeded him as premier, becoming president of the council and foreign minister. The breaking up of the Jesuit establishments in France was the first important work of his administration. His subsequent moderation in dealing with the other unauthorized ecclesiastical orders caused a split in his cabinet, and led to his resignation, Sept. 19, 1880, Jules Ferry becoming his successor as premier.

FURNIVALL, Frederick James, an English philologist, born at Egham, Surrey, Feb. 4, 1825. He was educated at University college, London, and Trinity hall, Cambridge, has devoted himself to the study of early and middle English literature, and is one of the founders of the new school of English philology. Under his care, as secretary of the philological society, the collection of materials for an exhaustive dictionary of the English language was begun about 1857, and continued for several years. He established the "Early English Text Society" in 1864, the "Chaucer Society" and the "Ballad Society" in 1868, and the "New Shakespeare Society" in 1874. He has raised and expended nearly £20,000 in the printing of early manuscripts and rare books, many of which he has edited himself, either for the above-named societies or for the Roxburghe club. These include "Saint Graal: the History of the Holy Grail, in English verse, by Henry Lancelich (A. D. 1440), with its Original, the Old-French Prose, *Histoire del Saint Graal*" (2 vols., 1861-'8); "Roberde of Brunne's 'Handlyng Synne' (on the Sins of England, with Legends, A. D. 1808), and the Old-French Poem on which it is founded" (1862); "Political, Religious, and Love Poems" (1866); "The Book of Quinte Essence" (1866); "Bishop Percy's Folio Manuscript of Ballads and Romances" (2 vols., 1867-'8); "Ballads from Manuscripts on the Condition of Tudor England, 1520-'50" (2 vols., 1868-'72); "Caxton's Book of Curteseye" (1868); "A Six-Text Print of Chaucer's Canterbury Tales, from the Manuscripts of Lord Ellesmere, Lord Leconfield, Mr. W. E. W. Wynne of Peniarth, the Cambridge University Library, Corpus Christi College, Oxford, and the British Museum" (7 parts, 1868-'75); "Parallel Edition of Chaucer's Minor Poems" (1876); and "William Goddard's Three Satires" (1877). Mr. Furnivall brought about a reform in the case of the ballast heavers, and was a member of

the executive committee of the workmen's college, London, in which he taught regularly for more than ten years.

FUSION DISK, an instrument by which steel bars may be cut in two as a piece of wood is cut by a saw. It is the invention of Jacob Reese of Pittsburgh, Pa. It is a circular saw, of soft iron, and it fuses steel bars which are brought into close proximity to it without touching. The bar to be cut is made to revolve in the contrary direction with a speed of 200 revolutions a minute. The revolving disk is 42 inches in diameter, $\frac{1}{4}$ inch thick; it is mounted on an arbor and set in motion with pulleys and belts, like an ordinary circular saw, and turns with a velocity of 2,800 revolutions, equal to a tangential velocity of 25,250 feet a minute. When the bar is brought almost into contact with the revolving disk, a small drop of molten metal appears on its surface. In a few seconds a notch is made, the molten metal flowing downward in a stream of sparks, and being thrown in sparks in all directions. The incandescent sparks, when they first leave the bar, are not hot. These sparks or drops of fused metal are of dazzling whiteness, yet their temperature differs but little from that of the surrounding atmosphere. In their path through the air those sparks which are projected sideways acquire heat from the friction. At the distance of five feet or more they burn like a red-hot poker, while their vivid incandescence has given place to a dull red color.

GALE, William, an English painter, born in London in 1832. He entered the schools of the royal academy in 1841, carried off three medals, and in 1845 exhibited "Young Oeladon and his Amelia." He went to Italy in 1851, spent several years in Rome, and in 1862, and again in 1867, visited the Holy Land, since which time he has dealt mainly with Scriptural subjects. His pictures are noted for their minute accuracy and finish. They include "Chaucer's Dream," "A Peep at the Carnival," "Going to the Sistine Chapel," "The Return of the Prodigal," "Cupid's Ambassador," "Abraham and Isaac on the Way to Sacrifice," "Eastern Springtime," "Spoils of War," "Sick and in Prison," "Little Grandma," and "An Algerian Interior."

GARFIELD, James Abram, 20th president of the United States, born in Orange, O., Nov. 19, 1831, died in Elberon, N. J., Sept. 19, 1881. He lost his father in his infancy, worked on a farm in his youth, and for three months was a canal boatman. He was a pupil and afterward a teacher in the public schools, then attended the Eclectic institute (now Hiram college) at Hiram, Portage co., where he was fitted for Williams college, graduating at the latter institution in 1856, and carrying off the metaphysical honor. Returning to Hiram, he became a teacher of languages in the school, and in 1857

its president. During this time he also studied law and was admitted to the bar. In 1859 and 1860 he was a member of the state senate. In 1861 he entered the army as colonel of the 42d Ohio volunteers, and served in Kentucky, where, in command of a brigade of 1,400 men, in January, 1862, he defeated 5,000 under Humphrey Marshall near Paintville, and drove them out of the state; for which he was made a brigadier general, being the youngest in the service. He subsequently served at Shiloh, at Corinth, and in Alabama, and in 1863 was appointed chief of staff of the army of the Cumberland, under Gen. Rosecrans. For gallantry at the battle of Chickamauga, he was made a major general of volunteers. He had been elected to congress in 1862, entered it in 1863, and was reelected eight times. In the house he had served on the committees on ways and means, Pacific railroads, rules, and banking and currency, and had been chairman of those on military affairs, appropriations, and others, becoming best known to the country in his connection with the committee on appropriations. From the time of the removal of Mr. Blaine to the senate in 1876, Gen. Garfield was recognized as the leader of the republican side of the house, and he was its candidate for speaker in 1877 and 1879. In January, 1880, he was elected United States senator from Ohio, to succeed Allen G. Thurman, for the term beginning March 4, 1881. In the Republican national convention held in Chicago, June 2-8, 1880, after a long contest in which Gen. U. S. Grant, James G. Blaine, and John Sherman were the principal contestants for the presidential nomination, most of the opponents of Gen. Grant united upon Mr. Garfield; and he was nominated on the 36th ballot, receiving 399 votes, against 306 for Gen. Grant and 50 scattering. He was elected in November by the votes of nearly all the northern states, and was inaugurated March 4, 1881. His nominations for cabinet appointments, which were promptly confirmed, were as follows: Secretary of state, James G. Blaine, of Maine; secretary of the treasury, William Windom, of Minnesota; attorney general, Wayne MacVeagh, of Pennsylvania; postmaster general, Thomas L. James, of New York; secretary of the interior, Samuel J. Kirkwood, of Iowa; secretary of war, Robert T. Lincoln, of Illinois; secretary of the navy, William H. Hunt, of Louisiana. In the time that intervened between the election and the inauguration, many of the party leaders had been called for consultation to Mentor, O., the home of the president-elect, among them his chief opponent, Senator Conkling, and it was believed that every necessary measure had been taken for a harmonious administration. But a difficulty soon appeared when the president nominated William H. Robertson for collector of the port of New York, and Mr. Conkling opposed the confirmation, on the ground that he should have been consulted as to all nominations for federal

offices in his own state. The contest became quite bitter, and resulted in the resignation of both senators from New York and a temporary division of the party. On the 2d of July, as the president entered the railway station at Washington, accompanied by Secretary Blaine, to take a train northward for a tour through New England (Mrs. Garfield intending to join him on the way), he was shot in the back by an assassin who had been dogging his footsteps for weeks. The murderer was an unsuccessful office-seeker, whose motive was partly revenge for being refused an appointment, and partly, if not mainly, a morbid desire for notoriety. He was tried in Washington, found guilty, and hanged June 30, 1882. The wounded president was at first carried to the office of the company, on the second floor of the building, and after an examination of the wound was taken back to the executive mansion. The physicians believed that the wound was not necessarily fatal, but that it was inadvisable to attempt to extract the bullet. It had fractured the right eleventh rib, and its course thence was believed to have been forward and downward, perhaps grazing the liver. The president remained at the White House, with varying symptoms, till the heat of the season began to have a decided effect, in spite of the fact that his apartment was kept cool by artificial means. On the 6th of September he was removed to the Francklyn cottage at Elberon, Long Branch, by a special train fitted up for the purpose. The speed was at times as high as sixty miles an hour, and the car was run to the door of the cottage on a track three quarters of a mile long that had been laid across the lawns for the occasion. Here the patient remained, with fluctuating symptoms, till the 19th, when at half-past 10 o'clock in the evening he expired. The autopsy showed that the diagnosis of the wound had been totally wrong. What was taken for the track of the ball proved to be a cavity produced by the burrowing of pus. The ball had crossed to the left side of the spinal column, passing through the front of it, and splintering it, and lodged below the pancreas, where it became encysted. The physicians' report said: "The immediate cause of death was secondary hæmorrhage from one of the mesenteric arteries adjoining the track of the ball, the blood rupturing the peritonæum, and nearly a pint escaping into the abdominal cavity." The general conclusion was, that the wound was necessarily mortal, and that nothing more could have been done if the diagnosis had been correct. The body was taken to Washington, where it lay in state in the rotunda of the capitol on the 22d, and was then carried to Cleveland, O., where the funeral services were held on the 26th, and the remains deposited in a tomb in Lakeview cemetery. President Garfield was a member of the sect called Disciples. He married in 1858 Lucretia Rudolph, who had been his pupil at Hiram. She and three children survive him.

After his death a popular subscription realized over \$360,000, of which the income is to be paid to Mrs. Garfield during her life, and the principal to be divided among the children after her death. More than forty of Garfield's congressional speeches have been published in pamphlet form, and also his oration on the life and character of Gen. George H. Thomas. A volume of brief selections, entitled "Garfield's Words," was compiled by W. R. Balch (Boston, 1881). His "Works," edited by Burke A. Hinsdale, were published in Boston in 1882 (2 vols., 8vo).

GARRET, Edward. See MAYO, ISABELLA, in supplement.

GAY, I. Sydney Howard, an American historian, born in Hingham, Mass., about 1820. He graduated at Harvard college, and began the study of law in his father's office in Hingham, but gave it up because his conscientious scruples on the subject of slavery would not permit him to take the oath to support the constitution of the United States. After some experience as an anti-slavery lecturer, he was for several years editor of the "Anti-Slavery Standard." Resigning this post in 1858, he joined the staff of the New York "Tribune," of which journal he was the managing editor from 1862 till July, 1865. From 1867 till November, 1871, he was the managing editor of the Chicago "Tribune." Later he was associated with William Cullen Bryant in the New York "Evening Post," and through that relation became the author of an illustrated "History of the United States" (4 vols. 8vo, New York, 1876-'80), to which Mr. Bryant's name was, with his assent, prefixed by the publishers. This history begins with the prehistoric races of America, and is brought down to the close of the civil war. Mr. Gay resides on Staten Island. **II. Winckworth Allan,** an American painter, brother of the preceding. He was a pupil of Robert Weir, and studied in Italy and France, a part of the time with Troyon. He resides in Boston, where he has attained reputation as a delineator of mountain and sea-coast scenery. He has travelled in Egypt, China, and Japan. "A Scene in the White Mountains," painted for the Boston Athenæum, and "A Scene in Japan," painted for the Somerset club of Boston, are specimens of his earlier and later styles.

GEIKIE, Archibald, a Scottish geologist, born in Edinburgh in 1835. He was educated at the university of his native city, and in 1855 was appointed to the geological survey. He was associated with Sir Roderick Murchison in working out the true geological structure of the highlands, and in preparing a new geological map of Scotland. In 1867 he was appointed director of the survey, and in 1870 accepted the new chair of mineralogy and geology at Edinburgh. He has published the following works: "The Story of a Boulder" (1858); "Life of Edward Forbes," conjointly with Dr. George Wilson (1861); "The Phenomena of the Gla-

cial "Drift of Scotland" (1863); "Scenery in Scotland viewed in connection with its Physical Geology" (1865); "A Student's Manual of Geology," conjointly with J. B. Jukes (1871); "Physical Geography" and "Geology," in the series of science primers (1874); "Memoir of Sir Roderick I. Murchison, with Notices of his Scientific Contemporaries and of the Rise and Progress of Palæozoic Geology in Britain" (2 vols., 1874); "Geological Map of Scotland" (1876); "Class Book of Physical Geography" (1877); and "Text-Book of Geology" (1882).

GEIKIE, Cunningham, an English clergyman, born in Edinburgh, Oct. 26, 1826. He is the son of a Presbyterian minister, and was educated at the high school and the university of Edinburgh. He followed his father to Canada, became pastor of a church near Toronto, and afterward was called to one in Halifax. In 1862 he accepted a pastorate in Sunderland, England, and five years later was called to old Islington chapel, London. In 1872 he relinquished his pastorate, devoting himself to literature. But in 1876 he took orders in the established church, and became assistant clergyman at St. Peter's, Dulwich. From 1879 to 1881 he was rector of Christ church, at Neuilly, Paris; and in May, 1883, Mr. Gladstone presented him to the living of St. Mary, Barnstaple, Devonshire. Dr. Geikie is an advocate of temperance and a champion of the evangelical party in the church, a frequent contributor to periodical literature, and a popular lecturer. He has published "The Backwoods of Canada" (London, 1864); "Entering on Life," a book for young men (1869); "The Great and Precious Promises" (1872); "The Life and Words of Christ" (1877); "Old Testament Portraits" (1878); "The English Reformation, and why we should uphold it" (1879); and "Hours with the Bible; or the Scriptures in the Light of Modern Discovery and Knowledge" (5 vols., 1881 et seq.). Most of his works have been republished in the United States. The "Life of Christ" has passed through 25 editions in England and several in this country.

GEORGIA. The population in 1880 was 1,542,180, of whom 762,981 were males, 779,199 females, 1,581,616 natives, 10,564 foreign, 816,906 whites, 725,138 colored. The chief agricultural productions were 23,202,018 bushels of corn, 5,548,743 of oats, 101,716 of rye, 3,159,771 of wheat, 14,409 tons of hay, 601 hogsheads of sugar, 1,565,784 gallons of molasses, 25,869,687 lbs. of rice, 814,441 bales of cotton, 228,590 lbs. of tobacco, 249,590 bushels of Irish and 4,397,778 of sweet potatoes; number of horses, 98,520; mules and asses, 182,078; working oxen, 50,026; milch cows, 815,073; other cattle, 544,812; sheep, 527,589; swine, 1,471,003; value of manufactures, \$36,440,948.—The report of the treasurer for the fiscal year from Oct. 1, 1881, to Sept. 30, 1882, shows that the total amount received in

the treasury was \$2,403,976 61, and the disbursements were \$1,713,507 48, leaving a balance in the treasury, Oct. 1, 1882, of \$690,472 15, in which are included \$275,000 in bonds of the state of Georgia (\$115,000) and in United States registered bonds (\$160,000) paid by the purchasers of the Macon and Brunswick railroad, and the suspended balances due from the Citizens' bank of Atlanta (\$83,218 51) and from the Bank of Rome (\$22,206 42). Deducting this unavailable amount, \$880,424 74, from the stated balance of \$690,472 15, the actual cash balance on Oct. 1, 1882, is \$310,047 41.—The public debt of the state is \$9,624,135, the annual interest on which amounts to \$645,440. Of this debt, \$100,000 mature in 1883; \$100,000 in 1884; \$175,685 in 1885; \$4,000,000 in 1886; \$2,098,000 in 1890; \$307,500 in 1892; \$542,000 in 1896; \$2,298,000 in 1898; and \$3,000 in 1932. The greater portion of this sum bears 7 per cent. interest. In addition to this bonded debt, the state is liable absolutely and contingently as endorser on bonds of the South Georgia and Florida railroad amounting to \$464,000, and on the bonds of the North-eastern railroad amounting to \$260,000.—The property owned and possessed by the state consists of the Western and Atlantic railroad, 188 m., leased at an annual rental of \$300,000, the lease having 9 years to run; Macon and Brunswick railroad, 195 m., sold for \$1,125,000, of which \$625,000 are yet due; bonds of the Marietta and North Georgia railroad, \$66,233 62; 186 shares of the Georgia railroad and banking company, \$25,000, and 440 shares of the Southern and Atlantic telegraph, guaranteed by the Western Union telegraph company, \$10,000. The estimated receipts at the treasury for the year ending Dec. 31, 1883, are \$1,350,000, and the estimated disbursements for the same period \$1,361,317 14. In 1877 the public debt was \$11,044,000, with an annual interest of \$800,000. In 1876 the state had a floating debt of \$256,000, all of which has been extinguished. The report of the comptroller general presents a very encouraging exhibit of the material condition of the state. The property of Georgia, as returned for taxation for the year 1882, shows an increase of \$16,255,150; the whole amount of taxable property being returned at \$287,249,408. The increase for 1881 was \$18,977,611, making the total growth of wealth for the two years \$35,232,761, yielding, at the existing rate of taxation (3 mills on the dollar), additional revenue to the amount of \$105,698. The table on the next page shows in a consolidated form the aggregate value of the whole property in Georgia returned for taxation for the years 1881 and 1882. The number of polls returned by colored taxpayers for 1882 is 93,685, owning property, real and personal, of the aggregate value of \$6,589,876. The report of the comptroller general as to the increase of revenue and its

DESCRIPTION OF PROPERTY.	Value, 1881.	Value, 1882.	Increase.	Decrease.
Improved lands.....	\$90,207,519	\$94,462,914	\$3,865,395	.....
Wild lands.....	1,586,915	2,273,827	536,912	.....
City and town property.....	55,682,801	60,458,967	4,581,186	.....
Building and loan associations (capital).....	256,110	308,496	52,386	.....
Bank shares (value).....	4,518,687	3,989,086	.....	\$579,551
Money and solvent debts.....	32,042,056	33,606,053	1,564,972	.....
Merchandise.....	15,662,547	14,091,125	423,578	.....
Capital in shipping.....	201,199	172,201	.....	28,998
Stocks and bonds (value).....	5,287,021	6,252,405	965,384	.....
Cotton factories.....	2,432,086	3,548,581	1,061,795	.....
Iron works.....	849,949	669,281	219,222	.....
Capital in mining.....	101,075	127,022	25,947	.....
Household furniture.....	9,938,399	10,157,645	174,486	.....
Watches, jewelry, plate.....	1,168,460	1,158,327	19,568	.....
Horses, mules, hogs, etc.....	23,688,394	22,514,937	.....	128,257
Plantation tools, etc.....	3,474,208	3,577,682	103,429	.....
Cotton, corn, etc., April 1st.....	980,160	946,818	.....	33,342
Other property.....	5,107,850	5,940,783	832,930	.....
Defaulters' property (single).....	996,811	1,396,500	400,629	.....
Railroad property.....	16,741,258	18,729,427	1,988,169	.....
Total.....	\$270,998,868	\$287,240,408	\$17,071,238	\$575,778
Total value of property, 1882.....				\$287,240,408
Total value of property, 1881.....				270,998,868
Increase in value for 1882.....				\$16,255,515

assured permanence induced the general assembly, at its session in November and December, 1882, to reduce the rate of taxation from 8 to 2½ mills.—The aggregate value of the taxable property of railroads in Georgia, as returned by their authorized agents for the year 1882, is \$18,729,429. Their business during the year, notwithstanding the reduction of their rates and fares by the railroad commission, and the increased competition, has been satisfactory. The roads generally are in good order; steel rails are being substituted for iron; their equipment has been much improved, and faster schedules are being adopted; 325 miles of new railroad were constructed during the year.—The university of Georgia, at Athens, Clarke co., including the state college of agriculture and the mechanic arts, the medical college at Augusta, and the branch preparatory colleges at Dahlonega, Milledgeville, Cuthbert, and Thomasville, shows a marked improvement. The total number of students for the collegiate year ending July 19, 1882, was 1,103.—The year 1882 shows a steady growth in the attendance of pupils at the public schools. The aggregate of school population was 507,861. In 1882 the state fund, estimating the poll tax at the same as in the previous year, amounts to \$441,114 83. And if the sum raised under local laws in counties and cities prove to be the same, that is, \$184,855 96, the whole sum raised in the state for the support of the public schools would amount to \$575,970 84, or \$77,000 increase as compared with the previous year. The school law requires that in every county arrangement shall be made for keeping the schools in operation at least three months of the year. This is an essential condition to a right to draw the *pro rata* of the school fund of the state. This was done in 1882 in every county by the parents of the school children agreeing to supplement the sum paid by the

state, and thus the entire people enjoyed the benefits of the common schools. In an enumerated school population—between the ages of 6 and 18—of 236,319 white and 197,125 colored, making in all 433,444, the number of illiterates between 10 and 18 years is, whites 22,823, colored 63,807; and over 18, the number unable to read is, whites 20,839, colored 143,494. There are 1,080 private elementary schools scattered over the state, with 1,183 instructors, teaching whites 26,822, colored 6,671—total, 33,493 children. Of male and female colleges, including Mercer university (Baptist), and Pio Nono college (Roman Catholic) at Macon, and Emory college (Methodist) at Oxford, and not counting the university of Georgia and its branches, there are 11 institutions of high grades, with upward of 2,000 students. The Atlanta university, where colored students exclusively are educated, and for the support of which the state appropriates annually \$8,000—a sum equal to that paid to the university of Georgia in payment of her debt to that institution—is well conducted, and is doing successful work.—The “New South” has made wonderful progress in manufactures during the past few years, and Georgia is in the lead. Cotton goods are necessarily the chief manufacture; but iron foundries, oil mills, shoe factories, &c., have sprung up in various parts of the state, and they are all prosperous. The Atlanta cotton exposition of 1881 has given a great impetus to manufacturing industry. The principal cotton factories are at Augusta and Columbus, the former using the water-power supplied by the canal, and the latter the water of the Chattahoochee river. The factories now in operation at Augusta are: the Augusta factory, capital \$1,000,000; consumes annually 13,084 bales of cotton; number of looms, 779; number of spindles, 26,000; producing 15,500,000 yards of goods. The Enterprise factory, capital

\$650,000, consumes 12,000 bales; number of looms, 900; number of spindles, 30,000; producing 13,000,000 yards. The Sibley mills, capital \$1,000,000, consuming 13,000 bales; number of looms, 800; number of spindles, 30,000; producing 12,000,000 yards. The Summerville mills, capital \$100,000, consuming 1,500 bales; number of looms, 150; number of spindles, 4,000; producing 2,250,000 yards. The Globe (private enterprise), consuming 2,000 bales; number of spindles, 5,800, producing warps and yarns. Riverside waste works (private), consuming 2,000 bales; number of spindles, 2,400, producing warps and yarns. Sterling mills (private), consuming 1,000 bales; number of spindles, 2,800; producing warps and yarns; and Goodrich (private) consuming 600 bales; number of spindles, 2,000; producing warps and yarns. The John P. King mills, in process of construction, and nearly complete, have a capital of \$1,000,000, and will run 750 looms and 25,000 spindles. Total number of looms, 3,379; spindles, 128,000; bales of cotton consumed during the year, 57,100. The Augusta factory has paid in cash dividends from 1865 to 1882, \$1,467,000, or about two and a half times its capital. Besides this, it has a surplus of between \$340,000 and \$350,000, or over 50 per cent. of its capital. Its stock is worth \$170 a share. The Augusta Crescent and Excelsior flour mills manufactured during the year 140,000 barrels of flour, valued at \$1,050,000, and 750,000 bushels of meal, valued at \$687,500. Another large and growing industry at Augusta is the Georgia chemical works, with a capital of \$200,000, for the manufacture of fertilizers. They made and sold during the year 15,000 tons, half of which amount was ammoniated and half acid phosphate. A factory has been built and is in operation at Kirkwood, near Atlanta, where sulphuric acid is made out of the iron pyrites, thousands of tons of which are scattered over the rocky hills, and at a much less cost than it could be produced from the imported sulphur. In immediate proximity to these works are two fertilizer factories, a cotton-seed-oil mill, and works for the reduction of copper. The principal factories at Columbus are: the Eagle and Phoenix mills, capital \$1,250,000, running 45,710 spindles and 1,600 looms, making 100 varieties of goods; the Columbus manufacturing company, capital \$268,000, running 4,156 spindles and 136 looms, making sheetings and domestics; Muscogee manufacturing company, capital \$157,000, running 5,000 spindles and 240 looms, making cottonades and domestics; the Steam Cotton mills, capital \$30,000, running 3,000 spindles, making yarn and thread; the Excelsior mills, capital \$25,000, running 96 looms, making checks and plaids; and A. Clegg & Co., capital \$10,000, running 48 looms, making checks and stripes. Besides the above, there are at Columbus a jute factory, turning out 2,000 yards of bagging daily; iron works, plough factory,

two large flour mills, a trunk factory, a clothing factory, a paper-box factory, and a gas-light company, with an aggregate capital of \$2,048,500. There is a cotton factory at Atlanta, three at Athens, and small mills in other parts of the state. A number of cotton-seed-oil mills have been started, or are being built. Broom factories, works for the manufacture of wooden ware, ice factories, carriage and wagon factories, and other industries have sprung into existence. The report of the comptroller general estimates the value of the iron works in the state in 1882 at \$569,231, an increase of \$219,282, as compared with their value in 1881. His estimate of the amount of capital invested in mining in 1882 is \$127,622, as compared with \$101,675 in 1881.—The lumber interest has grown largely. The exports coastwise from the port of Savannah alone up to Aug. 31, 1882, were 57,868,627 feet, and the foreign exports 14,675,279, making a total of 72,043,906 feet. The production of turpentine and naval stores from the immense pine forests has increased largely. The exports from Savannah for the year ending Aug. 31 were: turpentine, 1,635,250 gallons, worth \$786,593; rosin, 168,408 barrels, worth \$408,418.—The population of the principal places, by the census of 1880, was: Atlanta, 87,409; Savannah, 80,709; Augusta, 21,891; Macon, 12,749; Columbus, 10,123; Athens, 6,099. See map at beginning of this supplement.

GERM THEORY OF DISEASE, the doctrine that infectious diseases are caused by living microscopic organisms, whose germs have entered the animal structure in air, food, or drink, through wounds, or in other ways, which multiply within the body to a sufficient extent to interfere with the vital processes, consuming or preventing the healthy formation of the substance of the fluids or tissues. The discovery of the infusoria by Leeuwenhoek, followed by that of the spermatozoa in 1677, which were at first supposed to be real animals, was the occasion of the revival and wide acceptance of the germ theory, which had been advanced more than once during the middle ages. Among the advocates of the theory in the succeeding period were Kircher, Lancisi, Vallisneri, Réaumur, and Linnæus. In the earlier half of the 19th century the repeated mistakes of over-sanguine investigators, who announced that they had discovered the animalcules of smallpox, of cholera, and of other epidemic diseases, again and again, only to find that they had been misled by the bacteria of putrefaction, brought the germ theory into disrepute. Henle, a distinguished German physiologist, who maintained the doctrine of *contagium vivum* as early as 1840, and elaborated the theory with great ability in 1858, was almost alone in his ætiological opinions. The indefinite extent of the action of infectious poison, which spreads throughout the whole organism whose tissues or fluids are contaminated in only a single particle, and which can

be communicated by inoculation from one organism to another without end, and will manifest in the thousandth and the ten thousandth subject the same destructive vigor as at the outset, finds only two analogies in the other processes of nature: certain chemical phenomena, such as combustion, and the growth and reproduction of living organisms. At the time when the doctrine of living contagium was most discredited, the chemical theory was resorted to as a necessary alternative. The pathological phenomena of this class of diseases were held to be strictly analogous to the process of fermentation. Hence they were called zymotic or ferment diseases. The convincing evidence obtained in the experiments of Schwann and Pasteur of the organic nature of the different kinds of fermentation left the opponents of the germ theory without any ætiological hypothesis. The absence of all direct evidence of the presence of animalcules in the body affected by the morbid symptoms prevented the ancient and natural explanation by contagium vivum from overcoming the disfavor into which it had been brought by overbold speculation in preceding generations. In the course of a few years, however, the discoveries by Davaine, Koch, Cohn, Klein, and Pasteur of specific bacterial forms as the attendants of certain affections which have been classed with the zymotic diseases have brought the germ theory of disease into higher credit than it had ever enjoyed before. The tendency to revert to this doctrine received a strong impulse from the discoveries made in the life history of certain entozoic parasites—the identification of the tapeworm with the *cysticercus*, the discovery of the sexual process of the *trichina*, and of the manner in which both these organisms find their way into the human system. The brilliant dialectic of Pasteur and Tyndall, and their heated controversy, as upholders of the germ theory of fermentation and disease, with the advocates of spontaneous generation, have obtained for this and the allied questions a wide popular interest. The germ theory, which had been advanced in its modern form by individual pathologists as a conjectural explanation of epidemics at the time of the cholera pestilences of 1832 and 1849, first won an influential support after Pasteur's discoveries of the parasitic origin of the silkworm epidemics and of the grape disease. Subsequent to Davaine's spirited controversy with Sanson, Leplat, and other opponents regarding the organic nature of the poison of anthrax, the notion of contagium vivum obtained a strong hold upon the minds of the leading biologists and pathologists of Europe. In 1868 Davaine announced the rod-like bodies, observed by Pollender in 1855 and by Brauell in 1857 in the blood of animals and men, the victims of anthrax, to be genuine bacteria, or *bacteridia*, as he afterward called them, to distinguish them from the bacteria of putrefaction. Since that date the adherents of the germ theory have

been constantly growing in numbers, until it has become the prevailing doctrine. Other diseases counted as infectious have been proved since to be due to the propagation of living germs within the tissues; yet, with all the constantly accumulating evidence, the doctrine of parasitism, when applied to the most important and typical of the contagious and malarial diseases, still rests solely upon a theoretical basis. —The term "infectious" is applied to the class of diseases which it is sought to trace to the invasion of the body by living organisms, because they are due to some specific poisonous principle introduced into the system from without. These diseases collectively immeasurably exceed, in the extent of their ravages and in the deadliness of their effects, all the other maladies which afflict mankind, and far overbalance all other causes of death. The constant uniformity of their symptoms, their specific character, and the fact that they are invariably due to specific causes, each contagium producing its special disease, which conforms always to the one type and follows the same train of symptoms in every case, furnish not only the distinctive characteristics according to which infectious diseases are classified, but also, in connection with the contagiousness and unlimitedly propagable and inoculable qualities of most of them, the chief theoretical grounds for attributing them to living creatures multiplying within the fluids or fibres of the body. The idea of living contagia finds the most unquestioning acceptance and the most extensive application in Germany. A bacterial origin is claimed by prominent medical authorities in that country even for tuberculosis; and the efficacy of a novel cure for phthisis, which consists in inhaling fumes of the benzoate of sodium in large quantities, is attributed to the deadly effect of this substance upon the specific bacteria of the disease, to whose development in the lung tissue the tuberculating process is due, which is believed to be effectually arrested when the characteristic bacteria are destroyed by the benzoic vapors. This view is sustained to some extent by the results of experiments with rabbits confined in an atmosphere impregnated with vapor of sodium benzoate, in which the disease refused to develop, although ordinarily these animals are peculiarly subject to tubercular consumption, and can be infected invariably by inoculation. The bacteria, or microdemes, as they have more recently been called, which are regarded as the causes of so much mortality among both men and animals, are classed by De Bary, Nägeli, Cohn, and other German biologists as fungi, but by Dr. Burdon Sanderson and others are placed in the animal kingdom. Haeckel gives them, with the zoöphytes, a position intermediate between the two kingdoms into which organic nature is divided. Anthrax, splenic fever, or gangrene of the spleen (in German *Milchbrand*, in French *charbon*)—which occurs primarily in herbivorous animals, but is communicable to

man, and has occasionally raged as an epidemic in Asia and eastern Europe, notably in Russia, where it is known as the Siberian plague, in 1866—is proved to be caused by filamentous bacteria which multiply with enormous rapidity in the blood. The disease is attended with carbuncle, and is allied to malignant pustule. The bacteridia or schizomycetes, which constitute the specific poison of anthrax, are known at present under the name of *bacillus anthracis*. They are supposed to enter the body with drink. They fill even the smallest blood globules, but disappear entirely with the complete putrefaction of the blood. The facts that the blood of diseased animals soon lost its contagious qualities after death, while the disease would linger in a particular locality, reappearing in the same stable after several years of intermission, long puzzled investigators, until the researches of Koch cleared away the chief difficulties. Koch applied to the *B. anthracis*, which name he first bestowed upon this microphyte, the method of cultivation which has been employed by Pasteur and other observers of these minute organisms with most successful results. He found that while the bacteroidal forms observed in blood lost their vitality in about five weeks, the spores remained fertile for at least five years—a sufficient explanation of the mysterious tenacity with which the disease clings to particular spots, and returns after a disappearance of years. This bacillus is only distinguishable from the *B. subtilis* by the fact that while the latter is quite active, this one is motionless. It has been observed by Dr. Ewart, however, to pass through mobile stages at rare and irregular intervals. The similarity in the forms of the two bacteria has suggested the opinion that the *B. anthracis* is only a form of the ordinary *B. subtilis*, developed under certain circumstances. This hypothesis is based also on the fact that sudden inexplicable outbreaks of splenic fever occur at times among over-fed cattle. In a warm solution of the aqueous humor of an ox's eye, Koch observed a remarkably rapid growth of the anthrax bacillus. The short rods attained in three or four hours 10 and 20 times, and ultimately 100 times, their original length; in some cases running out straight, in others following beautiful curves, and in others becoming intricately interlaced and forming a matted mass. After some time the spore formation followed. The spores developed within the integuments of the filaments along their entire length, and in due course the envelope disintegrated and the rods fell to pieces, releasing the infinitesimal ovoid germs. Another of the infectious diseases to which animals are subject, the hog cholera or typhoid fever of the pig, has been traced to bacterial germs by Dr. Klein, who gives to the complaint the name of infectious pneumo-enteritis. He obtained the characteristic microphyte, and cultivated it in infusions. This is also a bacillus, more delicate than the bacillus of anthrax, which has a mo-

bile stage like the *B. subtilis*, and gives out spores and filaments like other bacilli. Both anthrax and pneumo-enteritis have been communicated by inoculation to mice and rabbits; the latter, however, with difficulty. It differs essentially from the other disease in the entire absence of the disturbing bacteria from the blood of the diseased animal.—Dr. Obermeier in 1867 made the important discovery of spirilla in the blood of persons suffering from relapsing fever. They appeared in immense numbers when the paroxysm was approaching, but no trace of them was found after it was over. This organism, the *spirochete Obermeiri* of Cohn, has been watched in its development in the blood of the diseased subject by Dr. Heydenreich, but not yet observed in the spore stage. The blood, in which alone this spirillum has been found, is infective, but only during the paroxysm; at that period the microphyte swarms in the blood, but disappears entirely during the remission of the attacks. This bacterium cannot be distinguished in its form from other organisms which are innocuous. This fact, which holds true also of the *bacillus anthracis*, and the further analogy that this disease breaks out during famine, while anthrax frequently accompanies repletion, afford grounds for supposing that these deadly agents are only special forms of common species developed under peculiar conditions. Davaine in 1860 was the first to detect bacteria in cases of malignant pustule. He found them in large groups in the centre of the pustules, between the epithelial cells, and in scattered groups separated by epithelial cells in the periphery of the pustules, whence they penetrate into the blood and lymph vessels of the skin. An affection related to anthrax is the recently discovered disease called *mycosis intestinalis*, which is characterized by the occurrence of immense numbers of bacteria and vibrios in the blood, and by purulent inflammation of the mucous coats of the stomach and intestines, with abundant schizomycetes, as the bacterial agents of infection have been called.—Extensive investigations have been undertaken for the specific bacteria of throat diphtheria. Micrococci and bacteria have been found of various kinds, and in any number, not only in the epithelium of the throat, but in the mucous and submucous coats, in the young exudation cells, in the lymphatic vessels, in the lungs, in the blood, urine, &c. The infectious character of this disease is well established. By inoculating rabbits with diphtheritic matter, peculiar and specific symptoms are produced. The micrococci have been observed to consume the entire nitrogenous contents of a cell in the space of 24 hours. On account of the constant presence of the ordinary bacteria of putrefaction, the characteristic bacterium of diphtheria, if there be one, has probably not yet been distinguished, unless, as has frequently been suggested, the ordinary vibrio of putrescent fermentation is the actual toxic agent in

the disease. Ewart and Simpson of London identify the specific microphyte of diphtheria with an exceedingly minute spore observed by them, which in a favorable medium germinates into long and very slender rods. When these spores are brought into contact with raw flesh, it is asserted that they give rise speedily to the formation of a diphtheritic membrane. Oertel, Klebs, and other German physicians hold that diphtheria is due to bacteria. Drs. Curtis and Satterthwaite assert, on the other hand, that the inoculation of rabbits with diphtheritic membrane produces only the same effects that putrescent infusions cause.—Septicæmia is traced beyond question to living organisms. The discoveries which have been made by Burdon Sanderson, Tyndall, and others, relating to the origin of pyæmic and other traumatic affections, have led to important reforms in hospital practice, which promise to obviate entirely the different forms of blood poisoning which have constituted the serious danger in hospital surgery. Two methods for the prevention of septic poisoning have been devised, both of which proceed upon the theory that the noxious principles are introduced into the wounds by microdermes. The method of Lister, which, modified and improved in many ways, has been extensively introduced, aims, by diffusing in the air carbolic acid, which is fatal to the microphytes, to prevent the living germs from coming in contact with the injured surface. The other method, the open-air treatment, has for its object the greatest possible dispersion of infectious organisms. The invasion of the damaged tissue by bacteria, generally supposed to be the common bacteria of putrescence, or the hay bacterium (*Bacillus subtilis*), is admitted to be the cause of wound fever, suppurative processes, mortification, &c.; yet they do not produce these degenerative processes by preying upon the fibres or fluids, or by increasing in such manner as to interfere with functional activities; the degeneration in these cases is the effect of a specific poison developed by the microphytes, as is proved by the fact that the septic poison can be obtained free from all germs and organisms in a clear fluid, which, after being filtered, boiled, and subjected to every test for the presence of living germs, retains its virulent qualities, with the difference that it then acts as an ordinary chemical poison, the noxious effects being proportional to the quantity introduced. Dr. Sanderson has shown that, while normally the common bacteroid forms do not possess in a marked degree the property of producing the septic poison when coming in contact with living tissue, or even with decayed tissue in the living body, yet it can be developed with increasing potency by injecting infusions containing these forms into the peritoneal cavity of a guinea pig, taking the effused fluid and injecting it again into a second animal, and so on. The result of this experiment offers a striking analogy to the development of intensified malignancy during the continuance of con-

tagious epidemics. In 1876 Tyndall opened hermetically sealed infusions in a room in the Bernese Oberland, in which a few years before he had dressed a slight wound that was followed by an abscess, and found the air strongly impregnated with putrefactive bacteria. In 1878 and 1879 Koch subjected septicæmia to a long and full series of experiments. He found that putrid blood injected under the skin of mice produced death in a few hours, yet the blood of the diseased animals exhibited no traces of bacterial life, and was incapable of producing symptoms of disease in other animals; the bacteria injected remained enclosed in the subcutaneous cellular tissue. The fact that a certain quantity of the fluid required to be introduced in order to produce the disease, led him to infer that the effect was due to the chemical action of the poison generated by the putrefactive bacteria, to which the name of septin or sepsin has been given. In about one third of the subjects, however, a true infectious disorder was produced, a peculiar form of septicæmia. The disease passed through a regular order of characteristic symptoms, and was followed after a certain period by death. He carried this infection through seventeen successive subjects. The diseased blood was found to swarm with a bacillus of a definite shape and size. No other bacteria injected with these bacilli spread in the living tissue. A micrococcus, however, occasionally occurred, which multiplied with great rapidity in the subcutaneous tissue. This microphyte, when injected into the ear of the mouse, produced progressive necrosis in the tissues of that organ, completely destroying them in a brief time. The septicæmic bacilli would not infect the field mouse at all, and the micrococcus, which thrived in this animal, would attack the tissues of the house mouse only when its blood was infected with the septicæmic bacteria. Injection of putrid blood into rabbits produced a very different effect, causing abscesses to form in the subcutaneous tissue, which gradually increased in size, and produced death in a few days. Examination of the abscesses showed them to be surrounded by a thin layer of micrococci in the zoöglæa state. The granular contents of the abscesses appear to be derived from the zoöglæa and the decomposed tissue which they infest. An infusion of the matter of the abscess invariably caused the same symptoms in healthy animals, but the injection of the blood of the dead rabbits had no effect. In pyæmia artificially produced in rabbits, a micrococcus was observed in the blood, occurring singly or in pairs, but neither in chains nor in zoöglæa films, and of a different form and size from those attending other diseases. He infected rabbits also with both septicæmia and erysipelas by putrescent infusions. The former was accompanied by a distinct form of micrococcus, and was capable of transmission; the latter was characterized by a small bacillus, and was not communicable.—Pasteur announced in 1879 that he had discovered the mi-

crophytes which are the toxic agents in malignant pustule and in puerperal fever. He is convinced by his researches that the bacterium discovered by Davaine is the true cause of malignant pustule. He obtained the organisms by cultivation, the method introduced by him in 1857. Sowing a drop of blood from a case of malignant pustule in the froth of beer yeast, and repeatedly infecting new yeast froth with the organisms, he kept on hand for years a constant supply. Malignant pustules were produced in guinea pigs, sheep, and other animals, by inoculating them with this liquid. In the same manner he has cultivated and infected fowls with the germs of poultry cholera. The microscopical organisms which produce puerperal fever are described by Pasteur as an entozoön containing two, four, or six cells united; the cells have an average diameter of two thousandths of a millimetre.—A heated controversy between the friends and the opponents of the bacterial hypothesis took place concerning the germinal particles conveying the virus of variola and cowpox observed by Cohn, by Beale, and by other microscopists in smallpox lymph and in vaccine lymph. While Cohn, Prof. Klebs, and Dr. Sanderson declare these granules to be micrococci, Dr. Beale asserts that they have no structural form. All agree that they have not been observed propagating, and that the infection takes place without their multiplying.—The least success in tracing disease to organic germs has been obtained in those classes which first suggested the theory, and for which it is a matter of transcendent importance to human civilization to discover this or some other preventable cause—the miasmatic diseases, and the so-called miasmatic-contagious class which is represented by cholera and yellow fever. The bacterial theory as applied to miasmatic contagium and elaborated by Nägeli is, that the germs, which are ordinarily harmless, acquire their poisonous potency in a special development under abnormal conditions. Dr. Eklund of the Swedish navy announced in 1878 that he had discovered the specific microdeme of malarial fever. The organism to which he claims to have traced the miasma he named the *lymnophyalis hyalina*. Profs. Klebs of Prague and Tommasi of Rome passed several weeks in the spring of 1879 in the Agro Romano, a part of the Roman Campagna, in which marsh or intermittent fever is particularly prevalent, in investigating the cause of this disease. The organism to which they succeeded in tracing the disease, and which they call a fungus, is a bacillus in structure, with peculiar characteristics. It exhibits numerous movable, shining spores of elongated ovoid form. They give to this organism the name of *bacillus malariae*. It is very abundant in the soil and in the air near the ground in that region. They cultivated it artificially in different kinds of soil. The residual solids of the bacteria, after the soluble matter had been washed out and filtered off repeatedly, when injected under the skin

of a dog, engendered the disease, which passed through all the characteristic symptoms in their regular order.—Of the other hypotheses advanced to explain the phenomena of epidemic and contagious diseases, in opposition to the germ theory, the chief is the bioplastic theory, the leading exponent of which is Dr. Lionel S. Beale of London. According to this, the infective material is bioplasm, as living protoplasmic matter is called, which has developed abnormally. Diseases consist in the growth of this degraded bioplasm in the place of healthy cells; and when a particle of it is grafted into a sound organism, the bastard process continues. (See Dr. Beale's "Disease Germs," London, 1874, and "The Microscope in Medicine," London, 1880.) The explanation of periodical epidemics by a dearth or superabundance of ozone or atmospheric electricity in the air, or by astronomical conditions, and other cosmo-tellurian hypotheses, are not as frequently advanced as formerly, but still have their supporters. Different theories, propounded by Dougall, Bastian, and others, make the degeneration of tissue in contagious disease the result of chemical changes.—The fullest exposition of the germ theory of contagious and miasmatic diseases is contained in the German work of Nägeli, *Die niederen Pflanz in ihren Beziehungen zu den Infektionskrankheiten und der Gesundheitspflege* (Munich, 1877). See also Wagner's "Manual of Pathology" (New York, 1877), and John S. Billings, M. D., in the supplement to Ziemsen's "Cyclopædia of the Practice of Medicine" (New York, 1879).

GERSTER, Etelka, a Hungarian singer, born at Kaschau, Hungary, June 16, 1857. She gave evidence of musical ability at a very early age, which was first recognized by the director of the conservatory at Vienna, who happened to hear her sing at the head of a religious procession in her native town. By his advice she studied for three years (1873-'6) with Mme. Marchesi; and in January, 1876, she made her début with great success at Venice as Gilda in Verdi's "Rigoletto." She afterward sang in the rôles of Ophelia, Lucia, Amina, and Marguerite. From Venice she went to Berlin, where she created an unexampled furor; the managers were compelled to ask that applications for seats be made in writing, and 21,000 such applications had to be refused. After singing in Buda-Pesth, she went to St. Petersburg, where her success was almost as great as in Berlin, and the court bestowed upon her costly presents and other marks of distinction. She first appeared in London in June, 1877, in "La Sonnambula," and sang there through the season of 1878; and in 1878-'9, and again in 1880, she appeared in the United States. She is married to Signor Gardini.

GILBERT, William Schwenck, an English dramatist, born in London, Nov. 18, 1836. He was educated at Great Ealing school, and took the degree of B. A. at the university of London. He was a clerk in the privy council office from

1857 to 1862. Studying law at the same time, he was called to the bar in November, 1864. He became connected with the Scotch militia, and in 1868 was made a captain in the royal Aberdeenshire highlanders. For two years he went the northern circuit, and during this period contributed articles to "Punch," "London Society," and "Fun," in the last of which appeared his humorous verses, afterward published in a volume entitled "Bab Ballads." Making the acquaintance of T. W. Robertson, the dramatic author, he was led to try his hand at writing for the stage; and in December, 1866, his first piece, "Dulcamara, or the Little Duck and the Great Quack," written in six days, a burlesque on "The Elixir of Love," was produced at St. James's theatre, and met with considerable success. It was followed three months later by an extravaganza on "La Figlia del Reggimento," entitled "La Vivandière," which was played at Liverpool and at the Queen's theatre, London. The same year he furnished a pantomime for the Lyceum. Many other pieces of the style of those just named followed, and in 1869 Mr. Gilbert's first comedy, "An Old Score," was played at the Gaiety. But he was first brought into general notice by "Ages Ago," a musical legend, the joint work of himself and Frederick Clay, which was given at the Gallery of Illustration in December, 1868. "A Sensation Novel," by Gilbert and T. G. Reed, was produced at the same place. "The Princess," a blank-verse parody upon Tennyson's poem, followed "An Old Score" at the Gaiety; and in November, 1870, came "The Palace of Truth," a fairy comedy founded on a story by Mme. de Genlis, at the Haymarket. Similar pieces were "Pygmalion and Galatea," probably his most successful work, and "The Wicked World," which had long runs at the Haymarket, beginning respectively in December, 1871, and January, 1873, and which were followed there by "Charity," a four-act play, in January, 1874. "Broken Hearts," another fairy play, but of a more serious character than the others, was furnished for the reopening of the Court theatre in 1876, and is preferred by its author to all his other works; but its reception by the public was not very favorable. He had previously furnished the same house with several pieces, among them "Randall's Thumb," "On Guard," "Great Expectations," and "Creatures of Impulse;" and "Sweethearts," a dramatic contrast in two acts, had been very successful at the Prince of Wales's theatre, where it came out in November, 1874. His adaptation of Mrs. Edwards's novel "Ought We to Visit Her?" was played earlier the same year at the Royalty. In 1876 "Tom Cobb," a farcical comedy, was rendered at the St. James's, and "Dan'l Druce," a drama, at the Haymarket. Two comic operas were produced the same year—"Trial by Jury," in the preparation of which Mr. Gilbert was associated with Arthur Sulli-

van, and "Princess Toto," the joint production of Messrs. Gilbert and Clay. "Engaged," a farcical comedy, followed "Dan'l Druce" at the Haymarket. "The Sorcerer" and "H. M. S. Pinafore," comic operas, the joint work of Messrs. Gilbert and Sullivan, were brought out at the Opéra Comique; and the latter, which was first played in May, 1878, attained extraordinary popularity both in England and the United States. Less successful works by Mr. Gilbert were "On Bail," and "The Spendthrift," comedies produced respectively at the Criterion in 1877 and the Olympic in 1878, and "Gretchen," an "improved" version of "Faust," which had a brief existence in the spring of 1879 at the Olympic. "The Spendthrift" was rewritten and named "The Ne'er-do-well," but it still proved a failure. "The Pirates of Penzance," another comic opera by Gilbert and Sullivan, was produced at the Fifth Avenue theatre, New York, under their personal superintendence, on Dec. 31, 1879, being played for one evening in a Devonshire village almost simultaneously, in order to secure an English copyright. "Patience," a comic opera that proved almost as successful as "Pinafore," was brought out in 1881, and "Iolanthe" in 1882. Several of Mr. Gilbert's dramatic works have been published in a volume (1876), and his "Bab Ballads" in two series, with illustrations by himself.

GILL, Edmund, an English landscape painter, born in London in 1820. After studying under his father, who was an occasional exhibitor at the Royal academy, he settled at Ludlow, in Shropshire. His works include "A Storm Scene at St. Gowan's;" "Fall of the Dugwy-Bettws-y Coed;" "Rhiadr Du, North Wales;" "Fall on the River Clyde;" "Cora Linn;" "The Waters dividing from the Dry Land;" and "Waterfall on the River Belle."

GLAIZE. I. Auguste Barthélemy, a French painter, born at Montpellier, Dec. 16, 1807. He was a pupil of Devéria. His principal works are "Quicksands" (which is in the Luxembourg), "The Blind Man and the Paralytic," "The Cynic and the Philanthropist," "Christ and the Woman taken in Adultery," "The Insect," "A Spectacle of Human Folly," "Force," "Salome," "The Death of John the Baptist," and "Herodias," the last three forming a triptych. **II. Pierre Paul Léon**, a French painter, son of the preceding, born in Paris in 1842. He studied under his father and Gérôme, and exhibited his first picture, "The Treason of Delilah," in 1859. His "Fauns and Nymphs" and "Hercules between Vice and Virtue" are in the museum of Montauban. In 1875 the government sent him to Amsterdam to copy Rembrandt's "Syndics." Besides some remarkable portraits, his works include "Samson taken by the Philistines," "Æsop at the House of Xanthus," "Samson breaking the Cords," "Christ and the Ten Lepers," "Nights of Penelope," "The First Duel," "Death of St. Louis," and "Fugitive Athenians."

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